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Areawide Waste Treatment and Water Quality Management Planning. Appendix A-1. Report on Point Sources of Pollution in Southern Illinois, 208 Area

Greater Egypt Regional Planning and Development Commission, Carbondale, IL

Prepared for

Environmental Protection Agency, Chicago, IL. Region V

Nov 78

Areawide Waste Treatment and Water Quality Management Planning

PB 297026

Report on Point Sources of Pollution in Southern Illinois 208 Area

Appendix A-1

Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Perry, Pope, Saline, and Williamson Counties, Illinois

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Areawide Waste Treatment and Water Quality Management Planning

5

Report on Point Sources of Pollution in Southern Illinois 208 Area

Appendix A–1

Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Perry, Pope, Saline, and Williamson Counties, Illinois

The preparation of this report was financed entirely with federal funds from the U.S. Environmental Protection Agency under grant number P005225-01 through a contract with the Greater Egypt Regional Planning and Development Commission. The contents do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use. Publication No. GERPDC-78-484.

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The Report on Point Sources of Pollution in Southern Illinois 208 Area is Appendix A-1 of the Areawide Waste Treatment and Water Quality Management Plan for Southern Illinois. The report was prepared under Section 208 of the Water Pollution Control Act, as amended. It addresses point sources of water pollution in the Southern Illinois 208 Area from municipal, industrial, private point, feedlot, water treatment plant, and mine discharges. Conclusions are provided, as well as recommended controls for implementation.

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November 1978

Michael P. Mauzy
Acting Director
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

Dear Mr. Mauzy:

The Commission is pleased to transmit Appendix A-1, Report on Point Sources of Pollution in Southern Illinois 208 Area of the 208 Areawide Waste Treatment and Water Quality Management Plan for Southern Illinois. The plan and this document cover the ten Illinois Counties of Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Perry, Pope, Saline, and Williamson.

This technical report is an integral part of the Southern Illinois Water Quality Management Plan that is designated to meet the contract requirements of Federal Grant Number P005225-01 under the U. S. Water Pollution Control Act Amendments of 1972, as administered by the United States Environmental Protection Agency.

We trust this submittal of this report, as well as the others comprising the plan, will provide the basis for certification of the plan and continued designation of this area.

Sincerely,

A. S. Kirkikis

A. S. Kirkikis
Executive Director

ASK:db

1a

ACKNOWLEDGMENTS

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United States Environmental Protection Agency

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The Regional Commissions express their appreciation to the Illinois Environmental Protection Agency for their assistance and cooperation during the initial planning program.

In addition, the Regional Commissions would like to thank the members of the Technical and Policy Advisory Committees to the program; the Federal and State Agencies; and the many public officials and citizens too numerous to mention who have offered information and suggestions during the initial phase of the planning program.

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Chapter 1

INTRODUCTION

Point Sources of Pollution

The Federal Water Pollution Control Act Amendment of 1972 sets forth requirements for controlling all types of water pollution. Section 208 of the Act requires areawide management planning in areas with substantial water quality control problems due to point or non-point sources of pollution. Ten Counties of Southern Illinois are designated for a 208 planning study. The objective of 208 planning is to meet the 1983 water quality goal through a plan, selecting a management agency(s) to implement the plan, and demonstrating that the initial plan will enable meeting the 1983 goal of the Act. This report will specifically address the point sources of pollution problems in the Southern Illinois 208 area. The term point source may be defined as:

> any discernible confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged.[1]

General Areas to be Considered

The point sources of pollution considered in this report are limited to those which create pollution problems within the area, and for which an NPDES (National Pollutants Discharge Elimination System) permit is issued by the Illinois Environmental Protection Agency. These point sources may be classified as municipal, industrial, private, feedlot, water treatment plants, and mines.

Municipal wastewater treatment constitutes the principal areawide concern within the general category of point sources of pollutants. Prior to 1970, the majority of the 81 incorporated cities and villages lacked a community collection and treatment system. Currently, about 57% of

the municipalities possess a central collection and wastewater treatment system.

Industrial wastewater does not appear to constitute an areawide problem. The area as a whole possesses a rather modest industrial base - less than a half dozen manufacturing concerns employ more than 400 persons, and only one exceeds 1,000 employees. As a general rule, industrial wastewater impacts are localized, and pose treatment problems for several municipal systems.

Private wastewater point sources consist of commercial establishments, institutional sources (rural schools, parks, nursing homes, churches), and residential (mobile home parks, subdivisions). Of the three, the residential group constitutes the principal concern.

Wastewater from point source feedlots and water treatment plants from the areawide perspective do not constitute complex water quality problem. Any impact on water quality which may occur is extremely localized, and is the result usually of poor operating practices.

Wastewater from mine point sources of pollutants constitutes a potentially complex water quality problem. This is particularly true of the wastewater resulting from the preparation and/or processing of coal. Water quality standards which are usually violated are TDS (1,000 mg/l) and sulfates (500 mg/l).

Point Source Considerations

Basic considerations in the planning process for each point source category are: the identification, description, and assessment of existing point sources; an evaluation of its impact on water quality; a determination of future flows and waste loads; and an identification of the available applicable control mechanisms. A companion report documents needed wastewater treatment needs, estimated capital construction costs, capital scheduling, financial considerations, and management strategies.

Inherent in the evaluation process is recognition of the state water quality and effluent standards promulgated by the Illinois Pollution

Control Board.[2] These standards establish the criteria by which the quantity, rates, and concentrations of physical, chemical, and biological constituents of wastewater are measured.

The principal parameters used to characterize wastewater are listed in Table 1. These analyses vary from precise quantitative chemical determination to the more qualitative biological and physical determinations. Further, many of the parameters are interrelated, depending upon the source of pollution.

The basic regulatory program administered by the Illinois Environmental Protection Agency consists of the enforcement of the water quality standards and the effluent standards, as well as the administration of the NPDES permit system. Other activities which may be interpreted as quasi-regulatory consist of the approval of specific applicable control mechanisms, especially for wastewater treatment systems.

Local units of government may impose a form of regulatory programs in that pretreatment may be required of industrial or other wastewater prior to entering the municipal system. Further, private wastewater systems are subject to local regulatory control where the population equivalent is 15 persons or less, and/or where five or less dwelling units are served by a system.

Other types of agencies which possess regulatory authority are: (1) the U.S. Army Corps of Engineers which issues permits to construct outfall or wastewater-related structures on navigable streams; (2) Water Districts and/or sanitary districts that may provide for the construction and operation of sewer systems; and (3) privately owned systems which construct and operate systems, as well as impose requirements for connection through covenants or through property ownership.

Mechanisms which may be employed to control point sources of pollution may be either structural or nonstructural, or a combination of both. Structural control mechanisms are interpreted as the construction of collection and treatment facilities with necessary appurtences. Nonstructural mechanisms normally include, but are not limited to, land use control ordinances; subdivision regulations; codes; taxation policies; and regulatory pricing policies. Traditionally, most units of government have depended upon structural control mechanisms to resolve point source problems with little emphasis on nonstructural mechanisms.

Table 1
PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS
OF WASTE WATER FROM POINT SOURCES

Parameter	Sources					
	Municipal	Private	Industrial	Water Supply	Feedlots	Mine
Physical						
Solids	x	x	x	x	x	x
Temperature	x	x	x		x	x
Color	x	x	x	x	x	x
Odor	x	x	x		x	
Chemical						
Organic:						
Protein	x	x			x	
Carbohydrates	x	x			x	
Fats,Oils & Grease	x	x	x			
Surfactants	x		x			
Phenols			x			
Pesticides					x	
Inorganic:						
pH			x			x
Chlorides	x	x		x	x	
Alkalinity	x	x		x	x	x
Nitrogen	x	x			x	
Phosphorus	x	x	x		x	
Sulfur			x	x		x
Toxic Compound			x			x
Heavy Metals			x			x
Gases:						
Oxygen				x		
Hydrogen Sulfide	x	x			x	
Methane	x	x			x	
Biological						
Protista	x	x			x	
Viruses	x	x			x	
Plants	x	x			x	
Animals	x	x			x	

Source: GERP&DC Staff.

A number of structural options are available to control point source pollutants prior to its discharge. The specific type of wastewater treatment is dependent upon the wastewater characteristics and level of treatment required to meet effluent standards. A summary of the more important treatment methods for point wastewater is given in Table 2. These processes, dependent upon the nature of the wastewater to be treated, may be employed either individually or in combination in order to meet effluent standards.

Nonstructural control measures often assist in reducing pollutant loadings on treatment systems through the control of the distribution, location, and development of structures which generate wastewaters requiring treatment. The following regulatory nonstructural measures are commonly used:

zoning	housing codes
subdivison regulations	development permits
planned unit development	drainage regulations
sewer ordinances	septic tank ordinances
sewer moratoria	industrial pretreatment regulations
taxation policies	land conservation
treatment charges	discharge permits

The key to effective control of point sources of pollutants is highly dependent upon the management strategies and capabilities of the management agency which operates and maintains the necessary wastewater treatment facilities. Depending upon an agency's assigned responsibilities under the areawide 208 plan, designated management agencies must have adequate authority and capability:

(1) to carry out it assigned portions of an approved areawide water quality management plan pursuant to Section 208 (a) (1)-(4) of the Act;

(2) to effectively manage waste treatment works and related point and nonpoint source facilities and practices serving such area in conformance with the approved plan;

(3) to directly, or by contract, design and construct new treatment works, and to operate and maintain new and existing works as required by any approved water quality management plan;

Table 2
WASTEWATER TREATMENT OPERATIONS AND PROCESSES

Description	Application
Physical Unit Operations	
Dialysis-Osmosis	Recovery of process materials, removal of dissolved solids.
Distillation	Removal of dissolved solids, separation of liquid wastes for recovery or disposal.
Evaporation: Dryers Multiple-effect Thermal Compression	Sludge dewatering, removal of volitile materials concentration of liquid wastes
Filtration: Filter Press Gravity Pressure Vacuum	Removal of suspended solids, sludge dewatering
Gas Transfer: Adsorption Aeration Stripping	Addition and removal of gases, removal of volitile oils
Screening: Rotary Vibratory	Removal of coarse floating and suspended solid materials
Sedimentation: Centrifugal Gravity	Removal of particulate matter, biological floc, chemical floc, concentration of sludges
Skimming	Removal of grease, oil, and floating material
Solvent Extraction	Removal of particular soluble waste constituents, recovery of soluble - process material
Chemical Unit Processes	
Adsorption	Removal of soluble organic compounds
Coagulation-flocculation	Removal of colloidal material
Combustion	Conversion of sludge to ash, reduction of organic content, volume reduction

Table 2 (Cont'd)

Ion Exchange	Recovery of specific ions and compounds, removal of ionized organic and inorganic compounds
Neutralization: Acid Bases	pH control
Oxidation: Air Chlorine Ozone	Disinfection, reduction of COD, precipitation of soluble nutrients
Reduction	Conversion of soluble compound to volatile or precipitate form for removal
Sorption	Removal of soluble organics, selected inorganic compounds
	Biological Unit Processes
Aerobic: Activated-sludge Lagoons Trickling-Filter Biological Rotating Disks	Removal of soluble or colloidal organic material
Anaerobic: Contact Process Digestion Filters Imhoff Tanks Septic Tanks Lagoons	Stabilization of organic sludges and organic wastes
Stabilization Ponds	Removal of soluble or colloidal organic materials
Land Treatment: Irrigation Overland Flow Infiltration-Percolation	Removal of soluble or colloidal organic material

Source: Metcalf and Eddy, Inc. Wastewater Egnineering. McGraw Hill Book Company, New York. 1972

(4) to accept and utilize grants or other funds from any source for waste treatment management or nonpoint source control purposes;

(5) to raise revenues, including the assessment of user charges;

(6) to incur short- and long-term indebtedness;

(7) to assure, in implementation of an approved water quality management plan, that each participating community pays its proportionate share of related costs.

(8) to refuse to receive wastes from a municipality or subdivision thereof which does not comply with provisions of the plan; and

(9) to accept for treatment industrial wastes.[3]

Units of local governments which possess these authorities with respect to point source controls include the municipalities, counties, river conservancy districts, and water districts (which may also serve as sanitary districts). The capabilities of these units of government vary and are reflective of the size of population they serve. The level of capability is also reflective of the experience the local units possess in controlling point sources of pollution, i.e., most communities of over 3,000 persons have been providing and managing wastewater collection and treatment services for over 30 years.

The effectiveness of management also varies with the size of the community, pollutant problem (which often is a function of the community's population), and the length of operating experience. Counties, with the exception of private disposal controls, and water districts have little or no management experience with respect to point sources of pollution.

The principal issue confronting management agencies appears to be the inability to finance, construct, and maintain increasingly expensive treatment systems without federal or state grant and loan assistance. Alternative innovative systems, ostensibly at lower initial capital costs, have not yet been proven to be more cost-effective within the area. These particular issues are addressed in the companion report to this document.

General Appraisal of Point Sources of Pollution

Point sources, although not the primary cause of water pollution in the area, do constitute a water quality problem. A number of existing point source discharges currently do not meet the state effluent and water quality standards. Although these discharges do not constitute the major pollutant source (as opposed to nonpoint sources), they are more subject to control. Impact of point source pollution on the area's streams are most notable during period of low or no-flow conditions.

Point sources of pollution may be ranked in terms of relative impact on water quality: (1) municipal and mine discharges; (2) private, industrial, and water plan discharges; and (3) feedlots.

In addition to the obvious reasons (effluent and water quality standards violations) there exist a number of areawide concerns which provide a further basis for controlling point sources of pollution:

(1) over 85% of the area's population is dependent upon surface water supplies (lakes);

(2) reservoirs other than water supplies are multi-purpose, and provide for a number of recreational activities, including swimming; and

(3) the areawide low permeability of soils often precludes the use of efficient private subsurface disposal systems resulting in overland flow that creates locally severe health hazards, expecially in the unsewered incorporated and/or unincorporated community where existing lots are undersized.

The point source pollutants have been classed into the following categories: municipal; industrial, private; feedlot; water treatment plant; and mining. The succeeding chapters address each of these categories.

FOOTNOTES FOR CHAPTER 1

[1]P.L. 92-500, Section 502 (14).

[2]Illinois Pollution Control Board, Illinois Pollution Control Board Rules and Regulations, Chapters 3, 4, and 5. Springfield, Illinois, 1977.

[3]CFR 40, Part 131.11 (0) (2), November 28, 1975.

Chapter 2

MUNICIPAL POINT SOURCE DISCHARGES

Definition

The point sources addressed in this chapter are the discharges of municipal treatment plants as well as the disposal of residual wastes, especially wastewater sludge. Municipal discharges enter the streams of the area through permanent structures (outfalls) such as pipes, culverts, or channels. Municipal, sanitary district, or other governmentally owned wastewater collection and treatment facilities are termed as publicly owned treatment works (POTW).

Existing Municipal Wastewater Treatment and Disposal Systems

The Southern Illinois 208 area contains a total of 81 incorporated municipalities of which 46 currently possess publicly owned treatment works. Three other municipalities are in the process of constructing systems. The location of the POTW's are identified on Map 1.

The Villages of Equality and Dowell, as well as the Lake of Egypt Water District, had been designated as health hazard areas resulting in special state legislative funding to finance 75% of new system construction.

Pursuant to the planning requirements of Section 201 of P.L. 92-500, the Illinois Environmental Protection Agency identified tentative Facility Planning Areas (FPA's) for each community. In several instances, single Facility Planning Areas contain two or more municipalities. The 65 identified facility planning areas encompassing the 81 municipalities within the 208 area are listed in Table 3.

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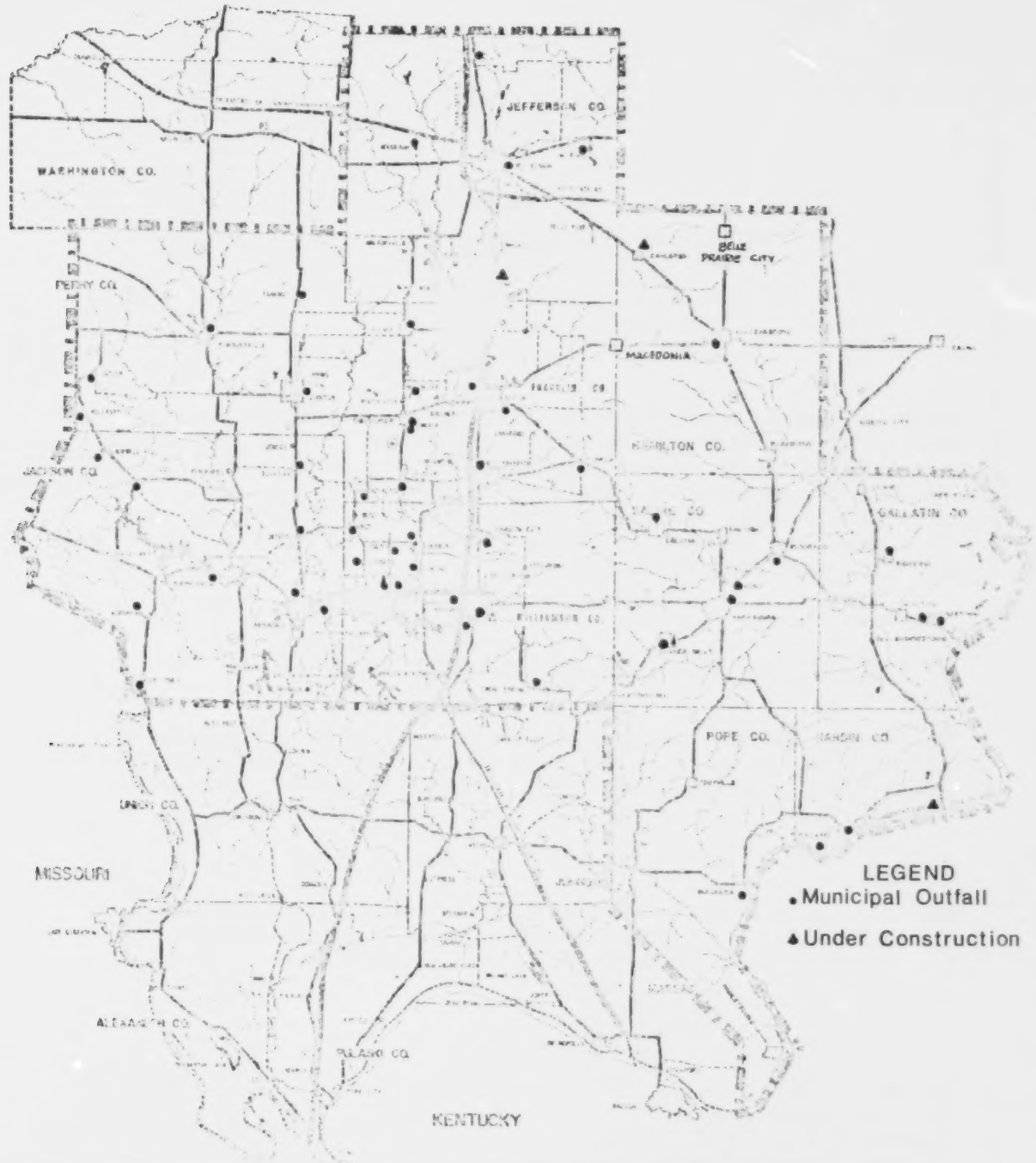
MUNCIPAL OUTFALLS



Map 1

NORTH

scale in miles

0 4 3 2 1 0 5 10

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

The preparation of this map was financially aided through Federal Grant No. P005225-01 through the U.S. Environmental Protection Agency under the Water Pollution Control Act Amendments of 1972.

Table 3
FACILITY PLANNING AREAS IN 208 AREA

1. Ava[4]
2. Belle Prairie City[1,4]
3. Belle Rive[1,4]
4. Benton, West City[1]
5. Bluford
6. Broughton[1,4]
7. Campbell Hill[4]
8. Carbondale
9. Carrier Mills
10. Carterville, Cambria, Crainville
11. Cave-In-Rock[3]
12. Christopher, North City[1]
    Urbain[1], Valier, Buckner[1]
13. Colp[4]
14. Creal Springs
15. Cutler[4]
16. Dahlgren[3]
17. DeSoto
18. Dix
19. DuQuoin, St. Johns
20. Eddyville[1,4]
21. Eldorado
22. Elizabethtown
23. Elkville, Dowell[1]
24. Equality[1,4]
25. Freeman Spur[1]
26. Galatia
27. Golconda[4]
28. Gorham[4]
29. Grand Tower[4]
30. Hamletsburg[1,4]
31. Hanaford[1,4]
32. Harrisburg, Muddy
33. Herrin, Energy
34. Hurst, Bush[1]
35. Johnston City, Whiteash[1]
36. Junction[1,4]
37. Lake of Egypt[2]
38. Macedonia[1,4]
39. Makanda[1,4]
40. Marion, Spillertown[1]
41. McLeansboro
42. Mt. Vernon
43. Murphysboro[4]
44. New Haven[1]
45. Omaha[1,4]
46. Pinckneyville
47. Pittsburg[1,4]
48. Raleigh[1]
49. Rend Lake-East[1], Bonnie[3],
    Ewing[1], Ina[3]
50. Rend Lake-North[1], Nason[1,4]
51. Ridgway[4]
52. Rosiclare
53. Royalton
54. Sesser
55. Shawneetown, Old Shawneetown[1]
56. Stonefort[1,4]
57. Tamaroa
58. Thompsonville
59. Vergennes[1,4]
60. Waltonville[1]
61. West Frankfort[4], Orient[1,4]
62. West Rend Lake[2]
63. Willisville
64. Woodlawn
65. Zeigler

NOTE: First community is FPA lead community.

Legend

[1]Community in FPA without sewage system.

[2]No municipality exists in FPA.

[3]Sewage system under construction.

[4]Communities under Municipal Wastewater Planning Needs Analysis study program.

The FPA is defined as that area which must be studied to prepare a facilities plan and to assure that the most cost-effective means of achieving the established water quality goals can be planned and implemented.[1] During the planning process, the entire FPA is evaluated with respect to population growth, land use patterns, and the projected waste treatment requirements. The actual service area proposed may not include the entire FPA, but must include areas where cost-effective centralized sewage collection and treatment is needed. As such, FPA's may not be coterminous with municipal corporate boundaries. It should be noted that FPA designation does not mean that a publicly owned treatment works should be constructed - only that the potential may exist for a centralized system for that area.

Approximately 55 communities are in some phase of the Section 201 planning, design, or construction process. A number of the 201 plans have yet to be completed, and only preliminary data is available concerning the cost-effective treatment needs.

Through funding from the Illinois Environmental Protection Agency, municipal wastewater planning needs analysis (MNA) studies were conducted for 26 communities within the 208 area (Table 3). These studies addressed communities whose priority ranking was below 600 or contained small populations. All MNA studies were performed by contract within the communities' consulting engineering firms.

The purpose of the MNA studies was directed toward (1) evaluating the existing environmental conditions related to wastewater disposal; (2) evaluating alternative solutions; and (3) identifying the most cost-effective system. These studies do not, however, totally replace the need for conducting Section 201 planning studies. All MNA studies have been completed.

Data available from both Section 201 planning studies as well as the MNA studies were utilized in this report for purposes of evaluating the municipal point source problem.

All the municipalities in the 208 study area have gravity type sewer systems. Available information on the existing wastewater collection systems indicates that the majority of large communities' sewer systems were installed from 1920 to 1940. The smaller communities have relatively newer sewer systems; for example, Tamaroa, Bluford, Muddy, Galatia, and Woodlawn completed their sewer systems in recent years. Other

communities, such as Cave-In Rock, Dahlgren, and Ina, are currently constructing sewer projects, and about 50% of the work has been completed.

The common problems related with sewer systems in the area are as follows:

(a) During regular street maintenance (usually by applying asphalt/concrete mixture across the streets' surface), manholes have have been covered with pavement material. After several years of such application, many of the manholes have been buried deep under the street surface. It is important for the manholes to be raised to the surface in order to prevent accumulation of poisonous and explosive gases in the system.

(b) Almost all of the municipalities practice sewage bypass (raw wastewater discharge without treatment). Such bypass discharge systems are usually located either near the wastewater treatment facility or in those segments of the sewer system where excessive infiltration/inflow problems occur during rainy periods. The bypassed wastes are discharged into a storm sewer or natural ditch; in both cases, the raw sewage flows into streams.

(c) During rainstorms of heavy intensity and/or long duration, sewage backs up into basements in several communities. Basement flooding by sewage backup presents a serious health hazard in the community and can result in significant damage to property.

(d) Inflow, the direct connection of the extraneous waters (as a result of rainfall) with the sewer system, does exist in the area's municipal sewer systems, although the extent of the problem cannot be determined without field study. In view of serious surcharging in the sanitary sewer system each time it rains, it seems realistic to suspect that a large number of roof drains, basement footing drains, seep tiles, and other inflow sources may be connected to the sanitary sewers in parts of the system.

(e) Infiltration (ground water flow into the sewer) is not uncommon in the 208 area's municipalities; it occurs when existing sewer lines undergo material and joint degradation and deterioration. In Southern Illinois, underground coal mine subsidence is one of the most common causes in developing cracks and sometimes destroying the sewer line.

Bypasses are illegal, and they must be eliminated; however, bypasses are normally installed for utilization when a sanitary sewer system or wastewater treatment plant is overloaded with excessive flow due to storm inflow or infiltration problems. A survey of the sanitary sewer systems for elimination of the sources of inflow or rehabilitation of sewer systems is needed to control infiltration. Removal of the bypasses without inflow/infiltration correction will result in continued flooding of basements and overflowing of the raw sewage at manholes. The elimination of inflow/ infiltration usually reduces the cost of wastewater collection and treatment. However, a logical and systematic evaluation of the sewer systems is necessary in order to determine the cost-effectiveness of any sewer system rehabilitation to eliminate infiltration/inflow.

The majority of the area's municipal sewers collect domestic types of wastewater from individual houses, commercial areas, trailer parks, subdivisions, schools, and small industries. A typical wastewater composition is given in Table 4. A few of the municipal systems do receive industrial-type wastes which affect the characteristics of the municipal wastes. The other factors which vary the composition of municipal wastewater are water conservation practices, garbage disposal, combined sewerage as well as infiltration/inflow into sanitary sewers. The Illinois Environmental Protection Agency suggests a treatment plan design for small communities or domestic-type wastewater treatment facilities of 0.17 lbs. BOD_5/person/day and 0.22 lbs. suspended solids/person/day.

The following systems are commonly employed in the area to treat municipal wastewater:

- Single lagoon or 3-cell stage lagoons;
- Trickling filter;
- Activated sludge.

The flow diagrams of these systems are illustrated in Figure 1. The three cell lagoon system is popular among small communities (under 2,500 population) because of its efficiency, cost-effectiveness, and exemption from effluent standards compliance for deoxygenating wastes. A large number of treatment facilities cannot meet the effluent standard requirement as a result of plant deterioration, age, and limited treatment capability (most to primary levels).

Table 4
TYPICAL COMPOSITION OF DOMESTIC SEWAGE
(all values except settleable solids are expressed in ml/liter)

Constituents	Concentration		
	Strong	Medium	Weak
Solids, total	1,200	700	350
Dissolved, total	850	500	250
Suspended, total	350	200	100
Settleable Solids (ml/liter)	20	10	5
Biochemical Oxygen Demand (BOD_5-20°C)	300	200	100
Total organic Carbon (TOC)	300	200	100
Chemical Oxygen Demand COD	1,000	500	250
Nitrogen, (total as N)	85	40	20
Organic	35	15	8
Free ammonia	50	25	12
Nitrites - Nitrates	0	0	0
Phosphorus (total as P)	20	10	6
Chlorides*	100	50	30
Alkalinity (as $CaCo_3$)*	200	100	50
Grease	150	100	50

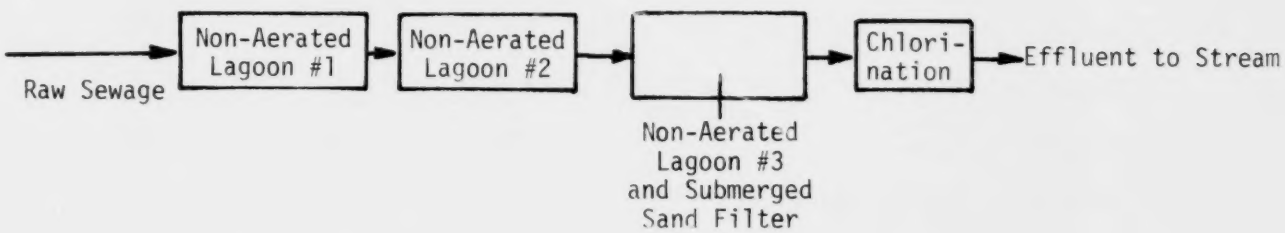
* Value should be increased by amount in Carriage Water. Carriage water refers to domestic water supply.

Source: American Society of Civil Engineers, American Waterworks Association, and Conference of State Sanitary Engineers. Water Treatment Plant Design, ASCE, New York. 1971.

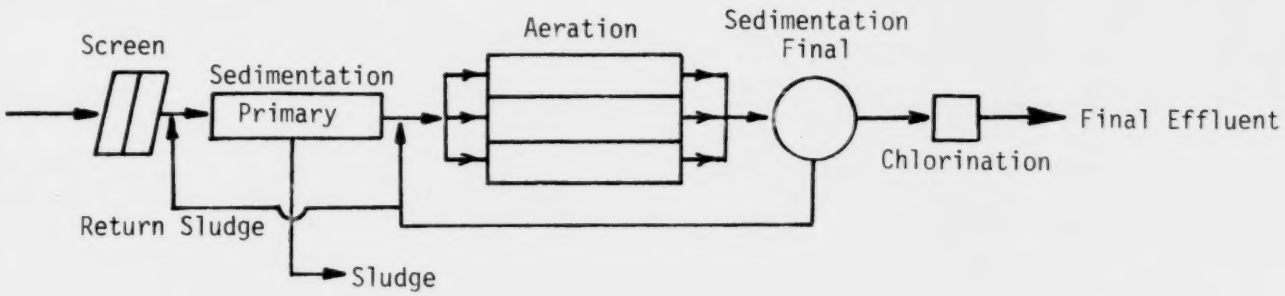
Figure 1

TYPICAL WASTEWATER TREATMENT SYSTEMS

3-Cell Lagoon with Submerged Sand Filter



Activated Sludge Process



Trickling Filter System

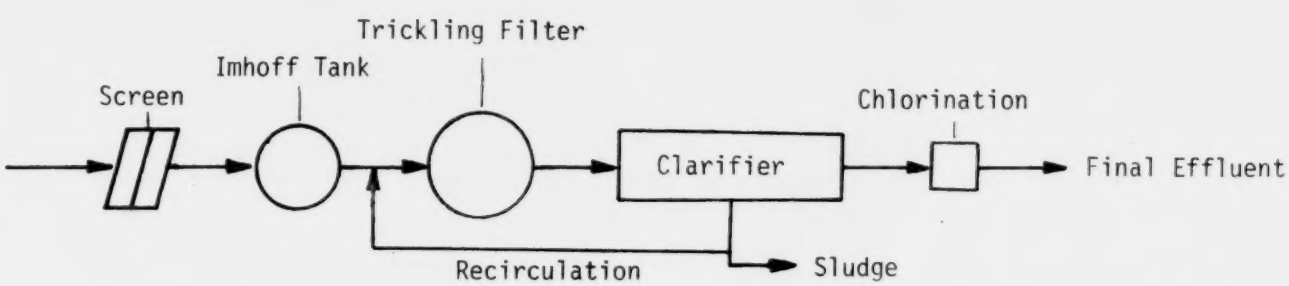


Table 5 shows all the municipal wastewater treatment plants in the 208 area; design flow and I.E.P.A. discharge number are also included in the table. The following existing treatment facilities are in process to upgrade and expand their plants: Carbondale, Hurst, Marion, Mt. Vernon, and Murphysboro.

Few municipalities of the area have enacted sewer ordinances. The lack of sewer ordinances has made possible the connection of external flows into the sewers creating inflow problems in several municipalities. It is a general policy of the area's municipalities not to extend sewer service outside corporate limits. One alternative left for the adjacent developing area is to be annexed by a municipality.

Those industries which are located within corporate limits discharge their wastes into publicly owned treatment facilities. The composition of such discharges is often not known. Most sewer ordinances do not require analyzation or pretreatment of the industrial discharges. Although these industries are relatively small, a thorough investigation of industrial discharges (qualitative/quantitative) will assure the efficiency of municipal wastewater treatment systems. The following specific types of shock loads are commonly encountered in municipal treatment plants as a result of discharges: (1) materials deleterious at trace levels; (2) qualitative shock loads; (3) quantitative shock loads; and (4) hydraulic shock loads.

Sewer moritoria is a regulatory action to restrict the extension of sewer service after determining that hydraulic and/or organic loadings have reached design capacity so that additional sewer connections violate state standards. The I.E.P.A. has included the following facilities of the 208 area on the restricted status list.

Facility	County
Carbondale (SE)	Jackson
Carterville	Williamson
De Soto	Jackson
Eldorado	Saline
McLeansboro (Foote St. Lift Station)	Hamilton
McLeansboro (Eastside Lift Station)	Hamilton
Mt. Vernon (Trickling Filter Plant)	Jefferson
Mt. Vernon (Lift Station #1)	Jefferson

Table 5
DESCRIPTION OF EXISTING MUNICIPAL SEWAGE TREATMENT PLANTS

Franklin Co.	IEPA Discharge Number	Type of Facility	Design Flow MGD
Benton	NZP055-01	Aerated grit chamber, trickling filter, clarifer	2.4
Christopher	N055-10	Two parallel one cell lagoon	0.52
Royalton	N055-06	One cell lagoon	0.135
Sesser	NZS055-01	Parallel imhoff tank, trickling filter, settling tank, chlorination	0.25
Thompsonville	NHBB055-01	Septic tank, intermittent sand filter, Chlorination	0.04
Valier	NZN055-01	3-stage lagoon, chlorination	0.08
West Frankfort	NH055-01	Trickling filter, secondary clarifier, polishing lagoon, chlorination	1.4
Zeigler	N055-04	Single stage lagoon, contact tank chlorination	0.234
Gallatin Co.			
Ridgeway	ATFA059-01	Complete mix with tertiary filtration	0.135
Shawneetown	A059-01/02	Single cell lagoon and imhoff tank, trickling filer	0.175
Hamilton Co.			
McLeansboro	ATFI065-01	Imhoff tank, trickling filter plant	0.35

Table 5 (Cont'd)

Hardin Co.	IEPA Discharge Number	Type of Facility	Design Flow MGD
Elizabethtown	A069-01	Activated sludge with chlorination	0.08
Rosiclaire	A069-02	Primary	
Jackson Co.			
Ava	NCB077-01	One cell lagoon	0.07
Campbell Hill	ILH077-01	One cell lagoon	0.03
Carbondale	ND077-04	Activated sludge, contact stabilization, chlorination, T.F.	7.0
DeSoto	NE077-02	One cell lagoon	0.15
Elkville	NEA077-01	Imhoff tank, trickling filter	0.1
Gorham	NZH077-01	3-stage lagoon	0.059
Grand Tower	N077-06	One cell lagoon	0.11
Murphysboro	N077-01	2-stage trickling filter, tertiary lagoon	1.27
Jefferson Co.			
Bluford	CANB081-01	3-stage lagoon, chlorination	0.093
Dix	NJ081-07	3-stage lagoon, chlorination	0.025
Mt. Vernon	NJ081-01	Trickling filter, clarifiers, tertiary lagoon chlorination	2.0

Table 5 (Cont'd)

Jefferson Co.	IEPA Discharge Number	Type of Facility	Design Flow MGD
Woodlawn	NO81-03	Settling tank, sandfilters, chorination	0.062
Perry Co.			
Cutler	NCDA145-01	One cell lagoon	0.058
DuQuoin	NEB145-06	Trickling filter, intermediate clarifier, trickling filter, final clarifier and tertiary filter	1.0
Pinckneyville	NC145-01	Sedimentation, Biological Oxidation, Tertiary Lagoon	0.75
Tamaroa	NE -	Three cell lagoon,Sand filter	-
Willisville	IIH145-01	One cell lagoon	.07
Pope Co.			
Golconda	A151-01	Secondary with activated sludge	0.1
Saline Co.			
Carrier Mills	ATH165-01	Activated sludge, contact stabilization plant	0.2
Eldorado	ATG165-01	Single cell stabilization pond	0.36
Galatia	ATGC165-04	Contact stabilization with tertiary filtration	0.16
Harrisburg	ATGB165-01	Contact stabilization, chlorination, aerated lagoon	1.25
Muddy	ATGB165-02	Polishing pond, activated sludge with chlorination	0.045

Table 5 (Cont'd)

Williamson Co.	IEPA Discharge Number	Type of Facility	Design Flow MGD
Cambria	N199-07	Three cell lagoon, intermittent sandfilter	0.16
Carterville	ND199-02	Primary clarifier, activated sludge, final clarifier, chlorination	0.3
Colp	NF188-07	Three cell lagoon, chlorination	0.045
Crainville	NF199-06	4-stage lagoon, chlorination	0.11
Creal Springs	ATHH199-01	One cell lagoon	0.1
Energy	NF199-02	One cell lagoon	0.1
Herrin	N199-01	Primary settling, trickling filter, secondary settling	1.2
Hurst	N199-02	Imhoff tank, trickling filter, final settling	0.1
Johnston City	NGA199-04	Single cell lagoon	0.4
Marion	ND199-06	Trickling filter, tertiary treatment, disinfection	1.8

Source: State of Illinois Environmental Protection Agency. Water Quality Management Basin Plan, Phase 1; Big Muddy River Basin, Volume 1; and Ohio River Basin, Volume 1, 1976.

Operation and maintenance requirements depend on the specific type of treatment system in use. Lagoon systems may require minimum attention such as mowing embankments and chemical applications to control weeds and algae. More sophisticated systems involving mechanical equipment usually requires one or more full-time operators.

The smaller communities often do not have full-time operators due to financial constraints. Larger communities, even with full-time staff, often experience treatment problems as a result of inadequate inspection and maintenance programs. Older systems such as those in Carterville, Do Soto, or Herrin require either replacement or major rehabilitation.

In the 208 area, there are no combined sewer systems. Storm sewers collect the runoff and directly discharge it into nearby natural ditches or streams without treatment. Although there are no combined sewers in the area's communities, many downspouts, footing drains, catch basins in streets, and various other sources of direct stormwater inflow to sanitary sewers make them very similar to combined sewers. Those sewers which have excess inflow problems also have bypass facilities.

Impact on Water Quality

A large number of discharges from municipal sources flow into 7-day, 10-year zero flow streams (as classified by U.S.G.S.). These streams flow only after considerable rainfall (0.5 or more). There is no direct discharge into the Mississippi River, but the Ohio River receives four municipal discharges through drainage ditches. The Illinois Environmental Protection Agency maintains a water quality monitoring network in the Big Muddy River Basin (27 stations) and Ohio-Saline River Basin (24 stations).

The samples at these stations are collected at least once a month; the water quality analysis data is available through STORET. Water quality data collected at 51 stations during a four-year period (1972-75), were analyzed for five water quality parameters (dissolved oxygen, total phosphorous, fecal coli, ammonia-nitrite, nitrite-nitrate) which may be violated due to municipal discharges. Fecal coli has been violated consistently in the Big Muddy Basin and in the Saline River Basin. This does not mean that water quality at those stations is good, but that low pH in the streams due to acid mine drainage may have eliminated the bacterial activity. Lusk Creek posessed good quality water and did not show any water quality violation. It is difficult to evaluate the

single source of fecal coli bacteria; this problem is aggregated as the combined affect of several point and non-point sources. Ammonia N constituted the second most frequent violation of water quality standards in both basins and is directly attributable to waste treatment systems.

To evaluate the impact of municipal discharges on regional waters, municipal wastewater treatment plants' effluent data, in terms of pollutants' concentration (mg/l) and load (lbs/day), is compared with the streams' water quality data (if available) downstream from the outfall. Table 6 shows the location of municipal discharges by watershed and the effluent quality. Those I.E.P.A. water quality monitoring stations which were closer to the discharge point were considered for impact evaluation. The average BOD-5 and suspended solids removed efficiency of large treatment facilities are above 85%, while small facilities' efficiencies are below 75% in most cases. BOD-5, suspended solid, ammonia-N, and fecal coli effluent standards are violated very often. The streams' water quality data does not indicate any violation of the dissolved oxygen standard. The dissolved oxygen in the streams maintained an average range of 7-8 mg/l concentration. The lowest, 6.2 mg/l of dissolved oxygen, was measured in Crab Orchard Creek, downstream from Marion's outfall. Periodic discharge of storm water from municipal areas and bypass discharges constitutes another kind of problem. A detailed field study will be required to quantify the impact. The relative impact on water quality due to municipal discharges does not appear significant as far as water quality of the streams is concerned. Following are the estimated aggregate waste loads which were discharged into the regional streams from municipal wastewater treatment plants during 1975.

BOD-5	3,131.8 lbs/day
Suspended Solids	3,914.3 lbs/day

The effluent waste load projections are estimated as a function of the projected population to be served by centralized collection and treatment systems. Individual system projections are contained in the respective municipal FPA reports or the Municipal Planning Needs Analysis studies and are summarized in the Municipal Wastewater Needs and Capital Scheduling report.

Table 7 reflects the areawide population projections.

Table 6

RELATIVE IMPACT OF MUNICIPAL SEWAGE TREATMENT PLANTS ON RECEIVING STREAMS

1st or 2nd Order Stream Basin	Effluent Receiving Streams	Municipal Discharges	Effluent Standard	Mean 1975 Effluent Data							Flow MGD	Nearest W.Q. Monitoring Station	1975 Stream W.Q. Data	
				pH	P	BOD-5	Fec. Coli	Amm. N	Nitrite-Nitrate	TSS			DO Mg/L	Fec. Coli
Big Muddy River Basin														
Big Muddy River	Big Muddy River	Murphysboro	20-25	7.5	--	46.9 332.5	1,040,000	14.04 99.5	1.22 8.65	24.0 170.1	0.85	---	--	--
	Worthen Bayou	Gorham	4-5	8.31	--	25.0 6.26	591	0.78 0.21	0.06 0.02	62.5 15.64	0.03	---	--	--
	Unnamed Ditch	Grand Tower	4-5	9.1	--	33.8 14.09	4,567	0.41 0.17	0.4 0.17	63.0 26.27	0.85	---	--	--
	Unnamed Trib.	Hurst	4-5	7.93	--	36.13 27.12	770,980	7.42 5.57	7.3 5.48	30.0 22.52	0.09	---	--	--
	Unnamed Trib.	Cambria	4-5	7.9	--	6.0 2.5	0	0.55 0.23	0.1 0.04	21.0 8.8	0.05	---	--	--
	Unnamed Trib.	Royalton	4-5	8.12	--	19.6 15.2	17,550	2.03 1.57	0.33 0.26	28.0 21.72	0.093	---	--	--
	Unnamed Trib.	Zeigler	4-5	8.0	--	17.8 30.14	6,200	1.43 2.42	0.31 0.52	46.0 77.9	0.203	N-04	8.9	314
	Willis Creek	Christopher N	4-5	8.61	--	34.4 37.3	8,980	1.94 2.1	0.14 0.15	84.5 91.6	0.13	---	--	--
	Willis Creek	Christopher S	4-5	8.8	--	32.9 32.9	12,600	0.8 0.8	0.19 0.19	96.0 96.0	0.12	---	--	--
	Unnamed Trib.	Valier	4-5	7.71	--	30.9 15.0	6,144	3.52 1.76	0.3 0.15	36.0 18.0	0.06	---	--	--
	Sugar Creek	Benton NW	4-5	7.11	--	26.0 216.8	215,480	3.4 28.4	9.4 78.4	20.0 166.8	1.0	---	--	--
	Unnamed Trib.	Woodlawn	4-5	7.9	1.3 0.11	23.0 1.92	0	0.25 0.02	0	55.0 4.6	0.01	---	--	--

Table 6 (Cont'd)

1st or 2nd Order Stream Basin	Effluent Receiving Streams	Municipal Discharges	Effluent Standard	Mean 1975 Effluent Data							Flow MGD	Nearest W.Q. Monitoring Station	1975 Stream W.Q. Data	
				pH	P	BOD-5	Fec. Coli	Amm. N	Nitrite-Nitrate	TSS			DO Mg/L	Fec. Coli
Rend Lake														
	Jackie Branch	Sesser	4-5	7.31	--	25.0 47.84	2,037	8.26 15.8	7.52 13.9	27.0 51.7	0.23	---	--	--
Beaucoup Creek														
	Rattle-snake Creek	Ava	4-5	8.24	--	31.3 10.44	23,560	2.38 0.79	0.71 0.24	27.0 9.01	0.04	NCB-01	9.95	1,931
	Pipestone Creek	Culter	4-5	8.45	--	35.5 15.1	48,666	5.1 2.17	0.32 0.14	63.0 26.8	0.051	---	--	--
	Galum Creek	Coulterville	4-5	8.56	--	31.6 34.3	4,333	0.9 0.98	0.19 0.21	116.0 125.8	0.13	---	--	--
	Beaucoup Creek	Pinckney-ville	4-5	7.55	--	5.1 12.76	200	3.0 7.51	3.7 9.26	12.0 30.0	0.3	NC-05	8.25	9,946
Crab Orchard Creek														
	Crab Orchard Creek	Carbondale SE	4-5	7.35	--	5.67 150.38	0	5.43 144.0	4.10 108.7	14.0 371.3	3.18	ND-01	8.45	1,740
	Little Crab Orchard Creek	Carbondale NW	4-5	7.81	--	21.0 87.57	104,460	4.4 18.35	8.05 33.6	74.3 309.8	0.5	---	--	--
	Unnamed Trib.	Marion Oxid. Pond	4-5	8.36	9.4 26.65	28.3 80.25	144.4	0.57 1.62	0.3 0.85	48.0 136.1	0.34	---	--	--
	Crab Orchard Creek	Marion SW	4-5	7.8	--	35.7 74.43	283	2.58 5.38	0.07 0.15	44.0 91.74	0.25	ND-03	6.18	19,516
	Crab Orchard Creek	Marion NW	4-5	7.55	6.0 9.26	44.09 68.02	878,840	6.32 9.75	6.99 10.78	38.0 58.63	0.185	ND-03	6.18	19,516

Table 6 (Cont'd)

1st or 2nd Order Stream Basin	Effluent Receiving Streams	Municipal Discharges	Effluent Standard	Mean 1975 Effluent Data							Flow MGD	Nearest W.Q. Monitoring Station	1975 Stream W.Q. Data	
				pH	P	BOD-5	Fec. Coli	Amm. N	Nitrite-Nitrate	TSS			DO Mg/L	Fec. Coli
Crab Orchard Lake														
	Unnamed Ditch	Carterville	4-5	7.38	--	67.6 141.51	615,237	11.4 23.9	0.5 1.05	74.0 154.9	0.251	---	--	--
Little Muddy River														
	Unnamed Trib.	DeSoto	4-5	8.24	--	40.0 21.02	70,724	2.5 1.31	0.61 0.32	99.0 52.0	0.063	NE-03	9.07	571
	Reese Creek	DuQuoin	4-5	7.29	9.45 55.17	32.0 186.8	312,406	4.49 26.2	3.66 21.4	17.0 99.3	0.7	NEB-01	7.78	574
	Unnamed Trib.	Elkville	4-5	7.79	--	32.0 21.35	673,909	5.12 3.42	6.97 4.65	30.0 20.0	0.08	---	--	--
	Collier Creek	Tamaroa	--	--	--	--	--	--	--	--	--	---	--	--
	Little Muddy River	Ashley S	4-5	8.75	--	26.0	15,750	1.7	1.7	73	--	---	--	--
	Little Muddy River	Ashley N	4-5	8.13	--	15.0	533	1.47	0.83	42	--	---	--	--
Hurricane Creek														
	Hurricane Creek	Crainville	4-5	8.13	--	18.0 3.0	333	4.02 0.67	0.17 0.03	23.0 3.84	0.02	---	--	--
	Hurricane Creek	Colp	4-5	7.3	--	3.0 0.68	3,900	0.75 0.17	0.4 0.09	60.0 13.5	0.027	NF-01	8.48	340
	Unnamed Trib.	Herrin	4-5	7.3	--	36.2 289.8	448,970	7.66 61.3	4.75 38.03	29.0 232.2	0.96	NF-01	8.48	340
	Unnamed Trib.	Energy	4-5	8.7	--	38.0 15.85	23,844	4.55 1.9	0.13 0.05	79.0 32.8	0.05	---	--	--

Table 6 (Cont'd)

1st or 2nd Order Stream Basin	Effluent Receiving Streams	Municipal Discharges	Effluent Standard	Mean 1975 Effluent Data							Flow MGD	Nearest W.Q. Monitoring Station	1975 Stream W.Q. Data	
				pH	P	BOD-5	Fec. Coli	Amm. N	Nitrite-Nitrate	TSS			DO Mg/L	Fec. Coli
Pond Creek														
	Lake Creek	Johnston City	4-5	8.42	--	28.0 93.4	23,570	3.71 12.4	0.33 1.1	44.0 146.8	0.4	NGA-01	10.57	16,680
Middle Fork Big Muddy River														
	Unnamed Ditch	West Frankfort	4-5	7.57	--	10.0 73.4	3,954	5.41 39.1	3.43 25.2	26.0 190.8	0.88	NH-05	7.68	1,460
	Unnamed Trib.	Benton SE	4-5	7.94	--	27 10.1	350	8.03 3.0	0.3 0.11	31 11.63	0.045	---	--	--
	Stevens Creek	Thompson-ville	4-5	7.1	--	8.0 1.0	264,100	6.23 0.78	21.7 2.71	7.0 0.88	0.015	---	--	--
Casey Fork	Unnamed Trib.	Dix	4-5	7.47	--	19.0 2.65	627	3.15 0.44	0.54 0.08	25.0 3.5	0.017	---	--	--
	Casey Fork	Mt. Vernon	4-5	7.71	4.7 39.2	13.0 108.4	36	5.84 48.71	3.01 25.1	24.0 200.2	1.0	NJ-07	8.13	1,428
Saline-Ohio River Basin														
Ohio River														
	Unnamed Trib.	Shawneetown S	4-5	7.75	--	38.25 42.11	2,126,250	4.18 4.6	8.63 9.5	83.62 92.07	0.132	---	--	--
	Unnamed Trib.	Shawneetown N	4-5	8.83	--	57.00 24.6	17,112	1.77 0.74	0.24 0.1	99.13 41.33	0.05	---	--	--
	Unnamed Ditch	Elizabeth-town	4-5	7.16	--	277.2 1.04	9,700,000	25.6 9.61	0.28 0.11	112.0 42.0	0.45	A-01	7.7	155
	Unnamed Ditch	Rosiclare	4-5	7.25	--	193.5 242	9,550,000	20.5 25.7	0.4 0.5	95.7 120.0	0.15	A-01	7.7	155

Table 6 (Cont'd)

1st or 2nd Order Stream Basin	Effluent Receiving Streams	Municipal Discharges	Effluent Standard	Mean 1975 Effluent Data							Flow MGD	Nearest W.Q. Monitoring Station	1975 Stream W.Q. Data	
				pH	P	BOD-5	Fec. Coli	Amm. N	Nitrite-Nitrate	TSS			DO Mg/L	Fec. Coli
	Unnamed Ditch	Golconda	4-5	7.13	--	137.5 97.5	975,000	8.93 6.33	3.83 2.72	186.0 132.0	0.085	A-01	7.7	155
North Fork Saline River														
	Crawford Creek	Ridgway	4-5	7.53	--	48.14 31.32	1,121,666	6.64 4.32	2.97 1.93	37.6 24.46	0.078	---	--	--
	Bear Creek	McLeans-boro	10-12	7.28	--	62.0 155.1	4,002,000	11.8 29.52	5.07 12.7	29.5 73.8	0.3	---	--	--
	Unnamed Trib.	Norris City	4-5	7.51	--	43.3 18.1	1,278,000	13.8 5.75	6.0 2.5	15.0 6.26	0.05	---	--	--
Middle Fork Saline River														
	Pankey Branch	Harrisburg	10-12	7.17	--	10.0 91.74	6,477	7.39 67.8	1.54 14.13	14.56 133.6	1.1	ATG-03	12.82	2,030
	Unnamed Ditch	Muddy	10-12	7.1	--	2.0 13.34	780,000	20.0 1.33	--	400.0 26.7	0.008	ATG-03	12.82	2,030
	Unnamed Creek	Eldorado	4-5	7.96	--	29.29 88.0	34,657	6.36 19.1	0.46 1.38	32.7 98.2	0.36	---	--	--
	Gassaway Creek	Galatia	4-5	--	--	--	--	--	--	--	--	ATG-04	10.72	990
South Fork Saline River														
	Unnamed Trib.	Carrier Mills	4-5	7.26	--	77.5 71.1	1,429,290	20.2 18.5	0.73 0.67	152.0 139.4	0.11	ATH-01	8.93	127
	Cana Creek	Creal Springs	4-5	8.29	--	31.0 25.85	5,213	1.0 0.83	0.26 0.22	28.0 23.35	0.1	ATH-02	8.7	3,058

NOTE: Under BOD-5, Ammonia-N, Nitrite-Nitrate, and Total Suspended Solids the top figure is MG/L and the bottom is Lb/Day.

Source: Table developed by GERP&DC Staff based on Illinois Environmental Protection Agency 1975 Waste Treatment Work Effluent Data.

Table 7
POPULATION (Thousands)

	1975	1985	1995
Sewered population	151	---	221+
Municipalities	171	194	218
Areawide	252	269	292

Source: GERP&DC Staff

The projections and trends are illustrated in Figure 2. Currently, about 60% of the area's population is connected to a sewer system; this percentage is projected to increase to 76% by 1995 based on the following assumptions and area trends:

(a) Population growth rate is in urban areas, and the developed stripped areas outside the corporate limits will be annexed by the municipality in the future.

(b) If the current level of wastewater collection/treatment grants and loans continues, all the municipalities will be sewered by 1995.

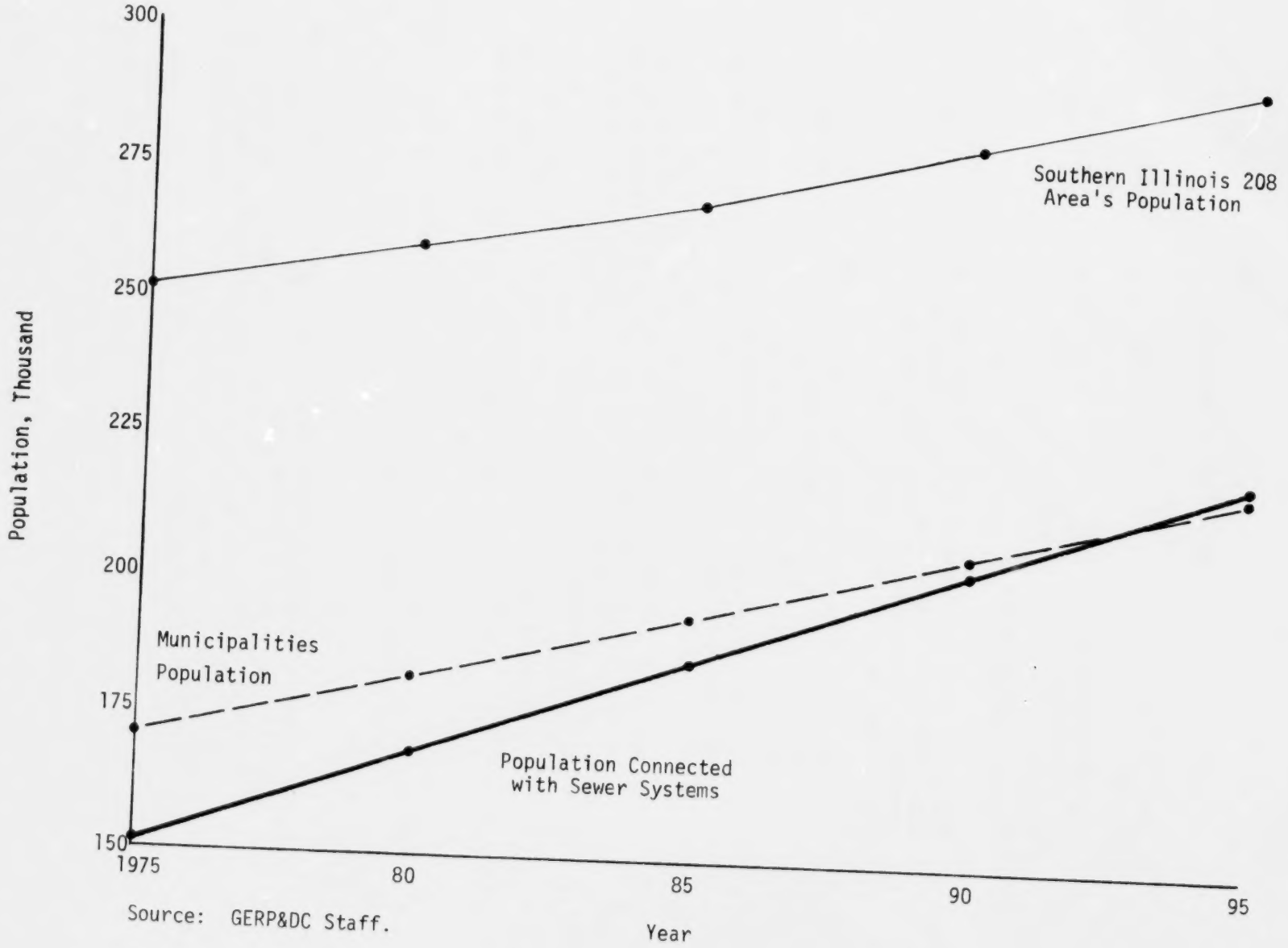
(c) A few non-municipal areas, such as Lake of Egypt, will be able to construct and operate sewage collection and treatment systems by creating sanitary districts, or existing water districts will assume the wastewater disposal responsibilities. This type of arrangement might spread the sewer system in rural areas, but it is not expected on a large scale in the area before 1995. In this projection, only Lake of Egypt is included; in case other rural sanitary districts outside corporate limits exist, the sewered population projection will be higher than 76% by 1995.

(d) Approximately 6% of the municipal population are not connected to municipal sewer systems.

The effluent waste loads (flow, BOD_5, and suspended solids) from municipal facilities are projected from 1975 to 1995. These projections are illustrated in Figures 3a and 3b. These flow, BOD_5, and suspended solids projected values, represent all the municipal discharges (including sanitary districts) in the 208 area. The following assumptions are made for waste load projections:

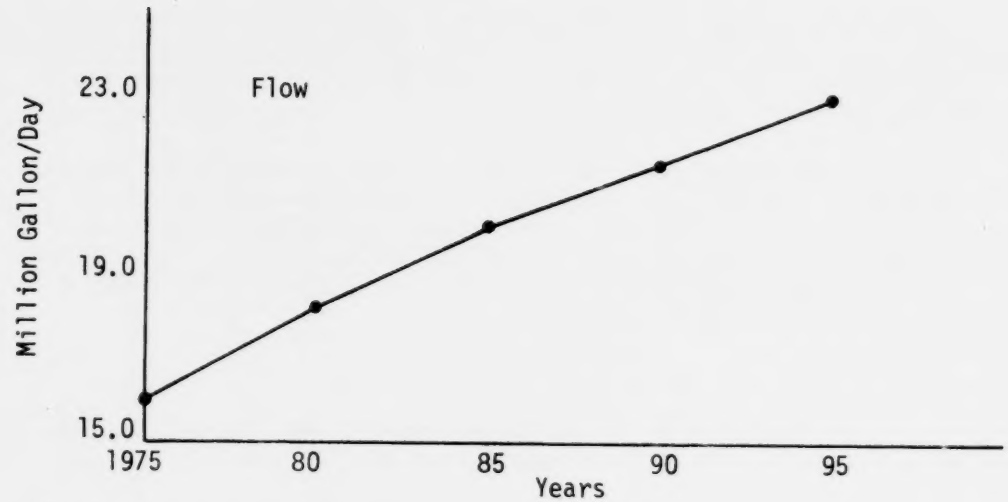
(a) All the facilities under construction and those facilities which have received wastewater collection/treatment construction grants will be in operation by 1980, and the effluent quality of the existing facilities will not change during this period.

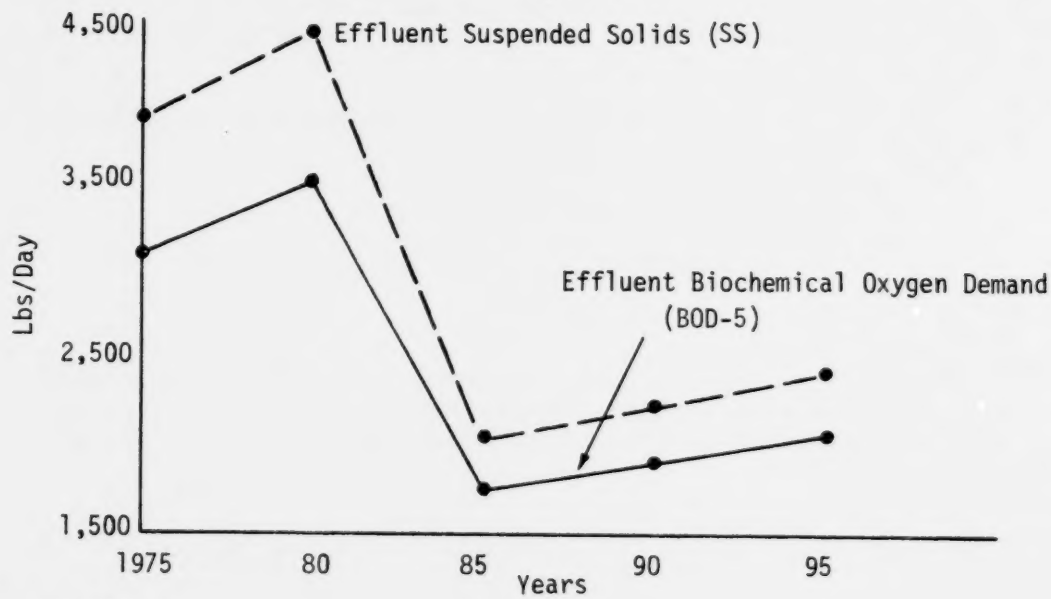
Figure 2
POPULATION PROJECTION VS. SEWER SYSTEM PROJECTION

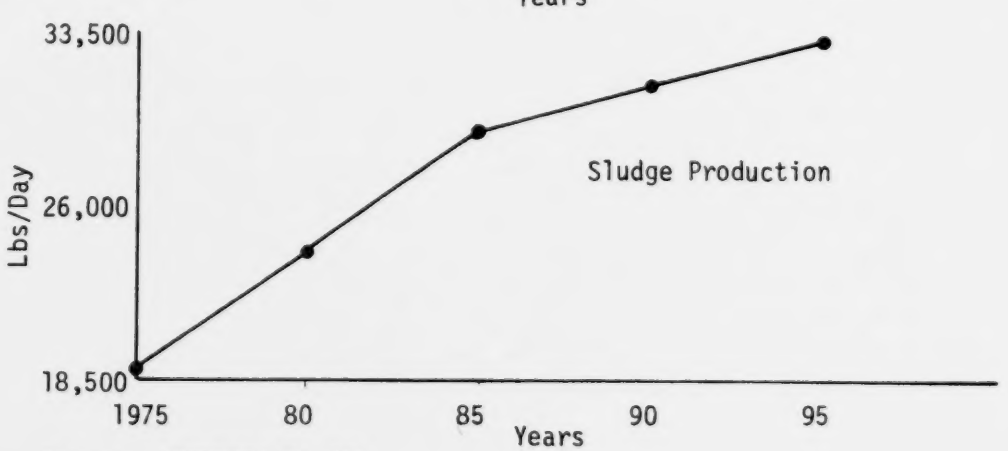


Source: GERP&DC Staff.

Figure 3
WASTELOAD PROJECTIONS FROM
MUNICIPAL WASTEWATER TREATMENT PLANTS
IN SOUTHERN ILLINOIS 208 AREA







Source: GERP&DC Staff.

(b) It is assumed that the municipal wastewater treatment facilities will meet the 1983 water quality goal and secondary treatment requirement; and that by 1985 all the discharges will meet the state effluent standards.

(c) All the municipalities (except perhaps Macedonia and Hamletsburg with a total 1995 population of 145) will construct sewer systems by 1995; also the Lake of Egypt (unincorporated area) will be served by a centralized sewage collection system. This assumption is made on the current level of federal grants for sewer systems and the area's need for it.

The flow is projected on a 100 gallon per person per day basis. The following factors may affect the waste load projections:

- Federal/State wastewater collection and treatment grants limitations for new facilities or upgrading and expanding the existing sewage works;
- Changing the 1983 secondary treatment requirements for publicly owned treatment works;
- Relaxation of the state effluent standard;
- New industrial discharges into municipal sewer systems.

Sludge production from wastewater treatment facilities (except lagoon systems) is projected for the 208 area, as illustrated in Figure 3c. The sludge production is projected for ten-year periods, as follows:

	1975	1985	1995
Sludge Production lbs/day	18,858	29,264	32,925

The waste load projection from municipal point source discharges for the 208 area are as follows:

	1975	1980	1985	1995
Flow, MGD	16.0	18.2	20.1	23.0
Effluent BOD_5 lbs/day	3,131.2	3,551.9	1.781.6	2,096.0
Effluent Suspended Solids, lbs/day	3,914.3	4,417.3	2,081.7	2,096.0

The wastes projection as illustrated in Figure 3b, define the relationship between waste parameters. Wastewater flow has shown a steady increase throughout the 20-year planning period. The BOD_{-5} and suspended solids increased during the first five years; then the effluent loading suddenly drops almost 50%, which represents the improvement in treatment plants' efficiency to meet the 1983 goals. It may be possible that the decrease in BOD-5 and suspended solids waste load will start before 1980, if the projects under construction by several large communities are completed. The sludge production is the result of pollutant removal capability of the wastewater treatment facilities. The sludge production rate is higher in the first decade because the facilities will treat the wastewater to its required efficiency to meet the effluent requirement for 1983. The sludge production increment in the second decade is due to the increase of flow.

The waste load projections indicate that, even after upgrading the existing wastewater treatment facilities, the waste load from municipal discharges cannot be eliminated completely. As a matter of fact, in the future the discharged waste load will be approximately the same, but corrective measures can prevent the area's water quality from degrading. The existing municipal discharges may not adversely affect the water quality due to the aeration capability and/or assimilation capacity of the streams. Where waste load projections continue without improving the existing facilities, the dissolved oxygen content will decrease, and impact water quality. The municipal discharges may create water pollution problems during low flow periods. The majority of the municipal outfalls are located on 7-day, 10-year zero flow streams, and most of the time the only stream flow results from the wastewater treatment plants' discharges. Pollutants are also contributed by sources other than municipal: agriculture, rural sewage, private discharges, and livestock operation discharges which affect the dissolved oxygen, phosphorous, Ammonia-N, Nitrate-Nitrite, and fecal coliform parameters of water quality.

Several municipalities are potential threats to the water quality of Rend Lake and Crab Orchard Lake. These lakes are multi-purpose lakes. The surface area of Rend Lake is 18,900 acres, and of Crab Orchard Lake is 6,910 acres. Furthermore, Rend Lake is the single largest source of public water supply in Southern Illinois. Crab Orchard Lake is part of a National Wildlife Refuge area. The list of the municipalities located in the lakes' watersheds are as follows:

Rend Lake	Crab Orchard Lake
Mt. Vernon	Marion
Dix	Carterville

Rend Lake	Crab Orchard Lake
Woodlawn	Pittsburg*
Waltonville*	Spillertown*
Nason City*	
Bonnie*	
Sesser	
Ina	
Ewing*	

* Communities without a sewer system.

Mt. Vernon, Marion, and Carterville are relatively large communities in the 208 area and their effluent can seriously degrade the lakes' water quality. Presently Mt. Vernon and Marion are in the process of upgrading their sewage treatment facilities. Crab Orchard is a shallow lake and is sensitive to the eutrophication process. Large quantities of nutrients (phosphorous and nitrogen) enter Crab Orchard Lake from municipal discharges, encouraging algae growth along the lake side. Phosphorous concentration in Casey Fork, which carries the City of Mt. Vernon's effluent, has been in violation of water quality standards. Hopefully, the reduction in these municipal discharges will reduce the nutrient loading and protect the lake's water quality. The city of Carterville is in the process of completing a 201 facility study. It is recommended that an alternate watershed (Hurricane Creek) should be evaluated to preserve and improve the water quality of Crab Orchard Lake. If the current trend of upgrading plants continues, municipal point source discharges may not be considered a significant water pollution source in the region.

Pollution Control Mechanisms

Municipal point source control may be instituted through either structural or nonstructural methods, or by a combination of both. Regardless of the methods utilized, institutional structures to implement these control methods will be necessary.

The application of the best practicable waste treatment technology (BPWTT) system of P.L. 92-500 by 1983 may not be a realistic approach to solve water quality problems in the Southern Illinois 208 area. It is anticipated that if the current level of U.S.E.P.A. municipal wastewater construction grants continues to be awarded to the local governments, then by 1983 all the municipal wastewater treatment facilities would be able to achieve secondary effluent limitation or tertiary treatment of

wastes. The unsewered communities of the planning area accommodate populations under 2,500, and most likely the future centralized sewage systems would be three-cell lagoons with submerged sand filters producing an excellent quality of effluent. On the basis of treatment level, various treatment alternatives are grouped as follows:

	Percentage Removal of Pollutants			
	BOD_{-5}	Suspended Solids	P	NH_3
Primary Treatment Screening Grit Removal Solid-Liquid Separation Imholf Tank Single-Cell Lagoon	30	50	0	0
Secondary Treatment Physical-Chemical Processes Activated Sludge Trickling Filter Biological Rotating Disks 3-Cell Lagoons	90	90	0-40	0
Tertiary Treatment Granular Filtration	95	95	0-20	0
Advance Treatment Activated Carbon Adsorption Phosphorous Removal Nitrogen Removal	95-99	95-99	80-90	90

Selection of a particular treatment system depends on characteristics of influent, type of treatment, and degree of treatment. Other factors which play important roles in selection of publicly owned wastewater treatment works are as follows:

A. Geographic
   - Climatic condition
   - Topography
   - Transportation
   - Distance from other communities (regionalization)
   - Land for ultimate sludge disposal or site for spray irrigation of the effluent (land application)
   - Location of treatment plant, outfall, etc.

B. Geological
- Soil types and depth of stratas
- Underground water level and flow
- Stream location and floodplain area
- Underground mining (active and abandoned) and potential mining

C. Community Growth
- Population
- Land use patterns (physical)
- Economic growth and industrial-commercial growth

D. Legislation Constraints
- Land use planning (zoning, subdivision regulations, etc.) and water rights
- Financial arrangements and tax policies
- Public acceptance
- I.E.P.A. requirements (standards, regulations, etc.) and U.S.E.P.A. grant policy

E. Environmental
- Water quality criteria
- Odor control/Noise control
- Air pollution
- Public health protection

Publicly owned wastewater collection and treatment systems are eligible for grants for up to 75% of the projects' construction cost. The U.S. Environmental Protection Agency which administers these grants requires an extensive study to evaluate the water pollution problems; for example:

(a) Substantial human habitation: The Agency's policy is that closely populated areas with average densities of 1.7 persons per acre (one household for every two acres) or more, shall be considered to meet the requirement. Population density should be evaluated block by block or, where typical city blocks do not exist, by area of five acres or less;

(b) Cost-effectiveness: New collector sewers must be proven, in the facility plan, to be necessary and cost-effective, in addition to the eligibility under the definition of "substantial human habitation" and the two-thirds rule. New collector sewers should be funded only when the system use (e.g., septic tanks or raw discharges from homes) for disposal of wastes from the existing population are creating serious public health problems, contaminating groundwater, or violating the point source discharge requirements of the act. Specific documentation of the nature and extent of health, groundwater, and discharge problems must be provided in the facility plan. The facility plan also documents the nature, number, and location of existing disposal systems (e.g., septic tanks) which are malfunctioning. A community survey of every

individual disposal system is recommended for this purpose and is grant eligible.

In addition, the facility plan must demonstrate, where population density is less than ten persons per acre, that alternatives are clearly less cost-effective than new gravity collector sewer construction and centralized treatment. Such alternatives include the following:

- Improved operation and maintenance of existing septic tanks;
- New septic tanks;
- Holding tanks and "honey wagons";
- Various means of upgrading septic tanks, including aerated mounds, alternate leaching fields, and pressure sewers;
- Other systems to serve individual households or clusters of households.

Where poor percolation rates and high groundwater are considered to restrict the use of individual on-site systems, these conditions must be documented in the facility plans by a summary of the results of percolation tests and soil borings. Finally, the facility plans, where applicable, must examine alternatives such as limited sewer service for a portion of a community. For example, septic systems may work well in several small towns with the exception of their business districts where open space for adequate on-site disposal is not sufficient.

If the above-mentioned requirements are the criteria for sewer collection grant eligibility, then all the unsewered communities of the Southern Illinois 208 area are grant eligible. Presently 30 municipalities of the region are seeking sewage collection/treatment construction grants. All the area's 201 facility planning studies recommend centralized sewer systems for unsewered communities. The municipal wastewater needs analysis studies for 26 communities conclude that centralized sewer collection systems are the best alternative for the unsewered communities in the area as a result of:

- existing health hazard situations due to the open discharges of wastewater;
- the area's tight or low permeable soils are not suitable for subsurface disposal;
- higher groundwater table and flood frequency in low land area; and
- shallow rock bed.

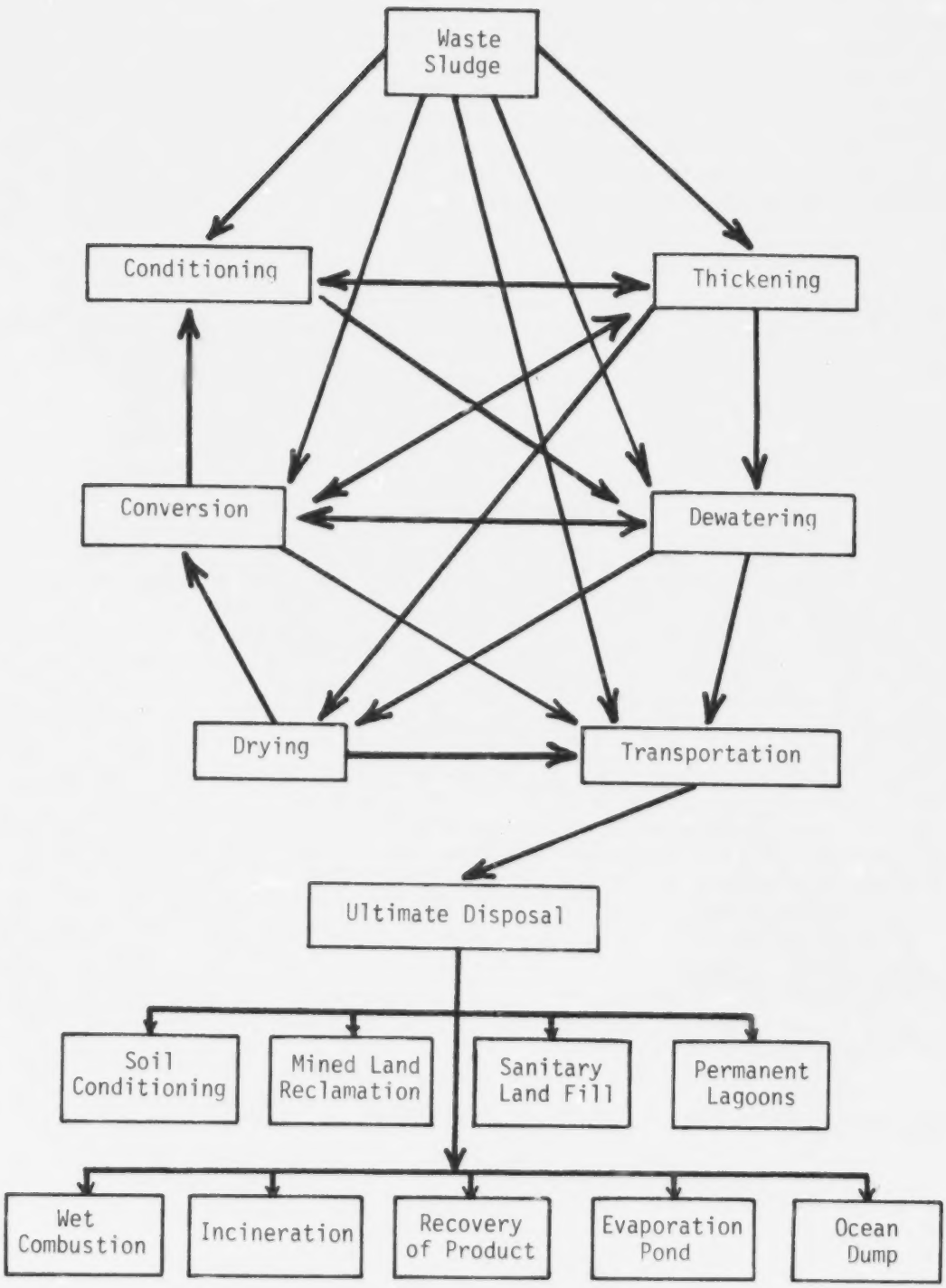
disposal systems, but the fundamental problem is lot sizes. These unsewered communities contain on the average 50' x 100' lot size per household, which is considered insufficient to meet the land required by modified on-site disposal systems such as mound systems. It is also cost effective to build a centralized collection/treatment facility rather than an on-site disposal system.

For small communities in the Southern Illinois 208 area, 3-cell lagoons, followed by sand filter systems are considered the most feasible alternative for wastewater treatment. After carefully reviewing the available technologies for waste treatment and their application, it is concluded that the land treatment alternative is very promising in rural type communities of the region. Recent federal regulations require evaluation of the land treatment alternative along with other non-traditional systems. Land treatment can be achieved by any of the following techniques: irrigation method; infiltration-percolation method; and overland flow method.

Two systems - irrigation and overland flow - appear promising for use within the area. Current use of these systems to date indicates little or no problems with effluent quality.

Wastewater treatment plants retain the pollutants from wastewater by utilizing physical, chemical, and biological processes and releasing the treated water into the environment. The residues most often are retained as suspensions of solids in liquid. The volume of sludge produced in waste treatment processes normally is small, compared to the volume of waste treated. Furthermore, additional water is often removed from sludges by sludge treatment processes. Figure 4 illustrates a wide variety of sludge treatment and disposal alternatives to provide an overview of the control approches available to local governments. Different sludge treatment processes can be arranged to make a sludge suitable for ultimate disposal to the environment. Most of the wastewater treatment facilities in the Southern Illinois 208 area do not generate sludge, because they employ a lagoon system; only large treatment plants or systems other than lagoons require sludge handling facilities. Figure 3c on page 33 shows the sludge production from the 208 area's municipal wastewater treatment facilities. The sludge production will be increasing in the planning area due to efficient wastewater treatment plants and expanding sewer services. Ultimate disposal of sludge requires serious consideration. Unplanned and mismanaged disposal of residual waste could not only create a nuisance to the public, but also degrade the surface and/or ground water quality. Controlled

Figure 4
ALTERNATIVES IN SLUDGE MANAGEMENT



Source: GERP&DC Staff.

application of municipal sludge for agriculture soil conditioning will improve the crop yield. Excess application on land or sludge spreading during rainy weather may carry the sludge particles in the streams through surface runoff. Lagooning of sludge is common in the area. In the future, sludge may be utilized to reclaim the coal mined land. The Palzo Reclamation Project is an example in the area, where the U.S. Department of Agriculture is applying the five-year-old sludge from Chicago to reclaim the abandoned surface mined land. The results of sludge application are encouraging. Sludge can be utilized in many ways, but its ultimate disposal is dependent on public opinion and the desirability of management agencies.

The 208 Water Quality Council should designate areas where municipal sludge could be utilized to reclaim the coal mined out areas or to condition agricultural soil. Such decisions should be based on sound technical data which precisely determines the impact of alternate ultimate sludge disposal projects on the regional waters.

The 208 areawide program provides a unique opportunity, on regional and state levels, to establish institutional arrangements to manage point source pollution. The regulatory requirements of PL 92-500, with notable exceptions in Section 208 and Section 306 (the new sources for performance standards), call on communities and industries to apply increasingly stringent treatment levels on current discharges. Municipalities may need to build secondary and/or tertiary treatment facilities to meet the effluent criteria. The State of Illinois has a statutory responsibility to regulate point and non-point sources of pollution in terms of both state water quality standards and the 1983 national water quality standards. The existing institution structure for municipal point sources of pollution control may not be sufficient. Several institutional alternative arrangements are being considered which will meet the federal/state requirements and fill in the voids of regional management programs. Three basic criteria for a comprehensive institutional structure are implementability; cost-effectiveness; and financial arrangement.

Alternate #1 Existing Municipal Wastewater Management

Wastewater Facility	Management Action	Management Agency
Collection, Treatment, disposal, industrial waste acceptance	Plan, finance Construct, O&M	Municipalities and Sanitary Districts

Wastewater Facility	Management Action	Management Agency
	A-95 review of federal grant application,	Regional Planning Commission
	Construction grant, regulate & monitor discharge, NPDES permits.	I.E.P.A.
Individual waste disposal system	Regulation enforcement, inspection	County/State Health Departments

Figure 5 illustrates alternate structure #1.

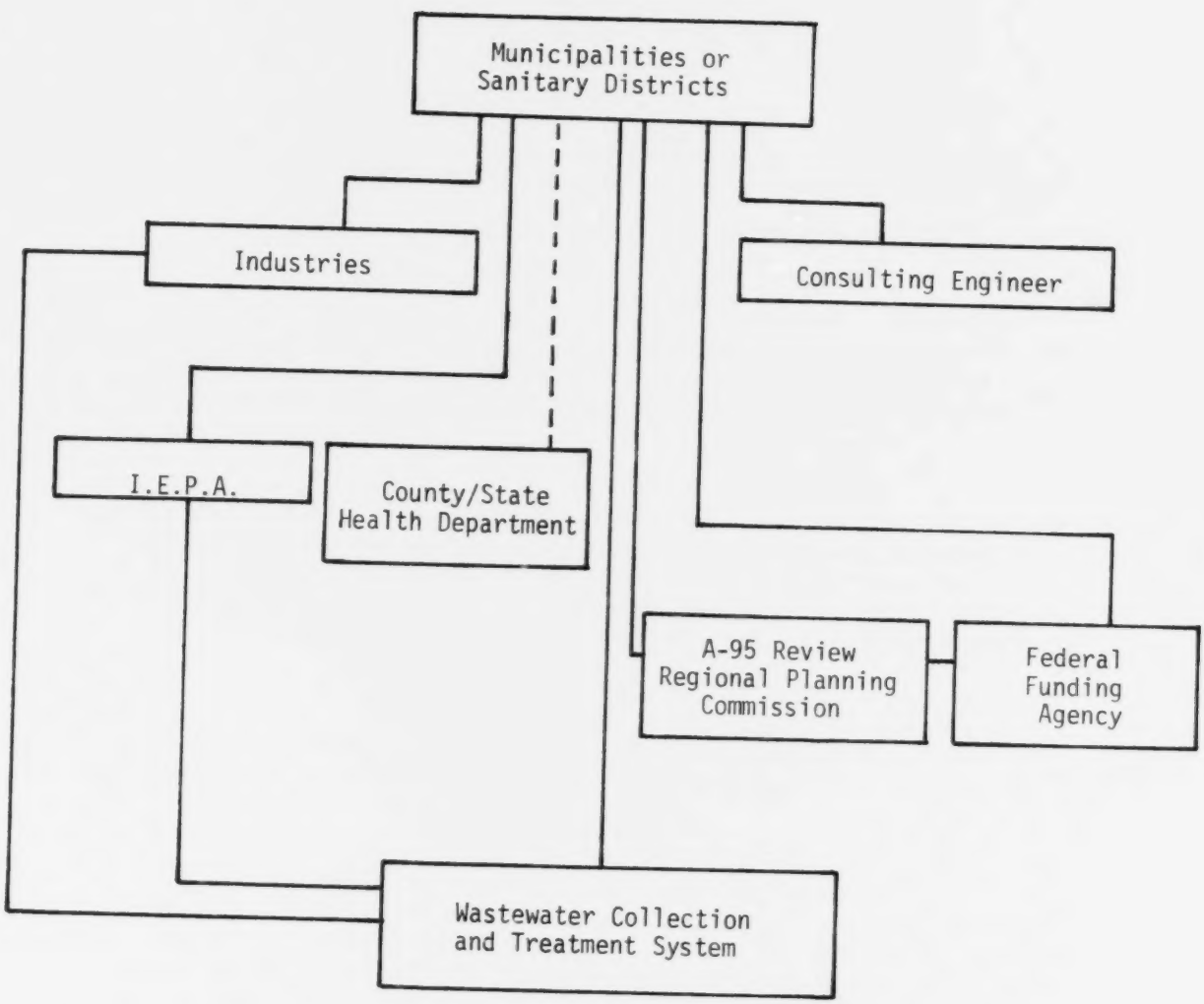
The existing institutional structure for point sources (municipal) is based on individual management agencies for each municipality. There are 49 publicly owned treatment works entities in the 208 area.

The following paragraphs constitute an overview of the existing management agencies general activities. There are no management agencies in unsewered municipalities for septic tank system management. The municipalities finance the Capital expenditures for wastewater collection and treatment facilities from several sources, such as the following:

- E.P.A./I.E.P.A. -- 75% construction grant;
- Fm.H.A. -- grant and/or loan;
- E.D.A./H.U.D. -- grant for sewer rehabilitation/extension;
- Bond Issuance authority -- General Obligation Bond or Revenue Bond.

These management agencies do accept industrial wastes without determining the quality and quantity of discharges. Several municipalities usually implement their programs through zoning, land use, and sewer ordinances. Annexation of the areas outside developed areas by a municipality is a common practice which suddenly increases the service area despite the lack of future sewer extension or improvement plans. The municipalities are often reluctant to cooperate with each other in a regionalized treatment facility program. Municipal governments are not interested in operating and maintaining septic tank systems. Municipal wastewater collection and treatment management agencies operate and maintain the systems through their staff; in case trouble occurs, consulting engineers of the municipality are required to correct the problem.

Figure 5
ALTERNATIVE #1



Existing Institutional Structure

Source: GERP&DC Staff.

The Illinois Environmental Protection Agency is the only regulatory agency for municipal point source discharges in the 208 area. I.E.P.A. prepares statewide wastewater collection/treatment works construction grant priority ranking. Recently, the NPDES permit issuance authority has been transferred from U.S.E.P.A. to I.E.P.A. Monitoring the effluent from municipal sources, restriction of sewer extension, and enforcement of water quality regulations are all part of I.E.P.A.'s surveillance program. The Regional Planning Commission through the A-95 process reviews federal grant applications for sewage collection and treatment facilities in the area. The Regional Planning Commission is not involved directly in the planning phase of the municipal wastewater facilities. Those municipalities which employ septic tank systems are regulated by county or state health departments.

The following summarizes an evaluation of Alternative #1:

1. Each municipality or sanitary district is a management agency.

2. Lack of future planning may result in the municipalities creating health hazards and water pollution problems. Furthermore, future needs of the community may not be assessed carefully, resulting in inadequately sized sewage collection and treatment facilities as well as in substantially increased operational costs to the residents. Water quality would not reflect any improvement.

3. The potential for regionalization has not been fully explored in this management structure. Regionalization, where feasible, may be a cost-effective alternative method for small municipalities to dispose of their effluent.

4. The state would continue to be involved in extensive planning and regulatory programs for the area.

Alternate #2 Modified Existing Municipal Wastewater Management Structure Through Single Areawide Management Planning Agency and Existing Management Agencies

Wastewater Facility	Management Solution	Management Agency
Collection, Treatment and disposal	Construct, O&M Finance, Plan	Local Governments
	Land use control	Designated management agencies

Wastewater Facility	Management Solution	Management Agency
	Waste allocation, Industrial pretreatment, A-95 review	Areawide Management Planning Agency
	Regulate, NPDES permit	I.E.P.A.

Comprehensive Functions	Management Agency
Regulate siting, discharges of all developments around lake; land use planning; advisory to local government on ordinances; waste allocation; 208 plan implementation. Coordinate all source control through A-95 review; certify permits and grant evaluation compliance with plan.	Areawide Management Planning Agency
Wastewater collection and treatment construction grant, monitoring water quality and discharges.	I.E.P.A.

Figure 6 illustrates alternate structure #2.

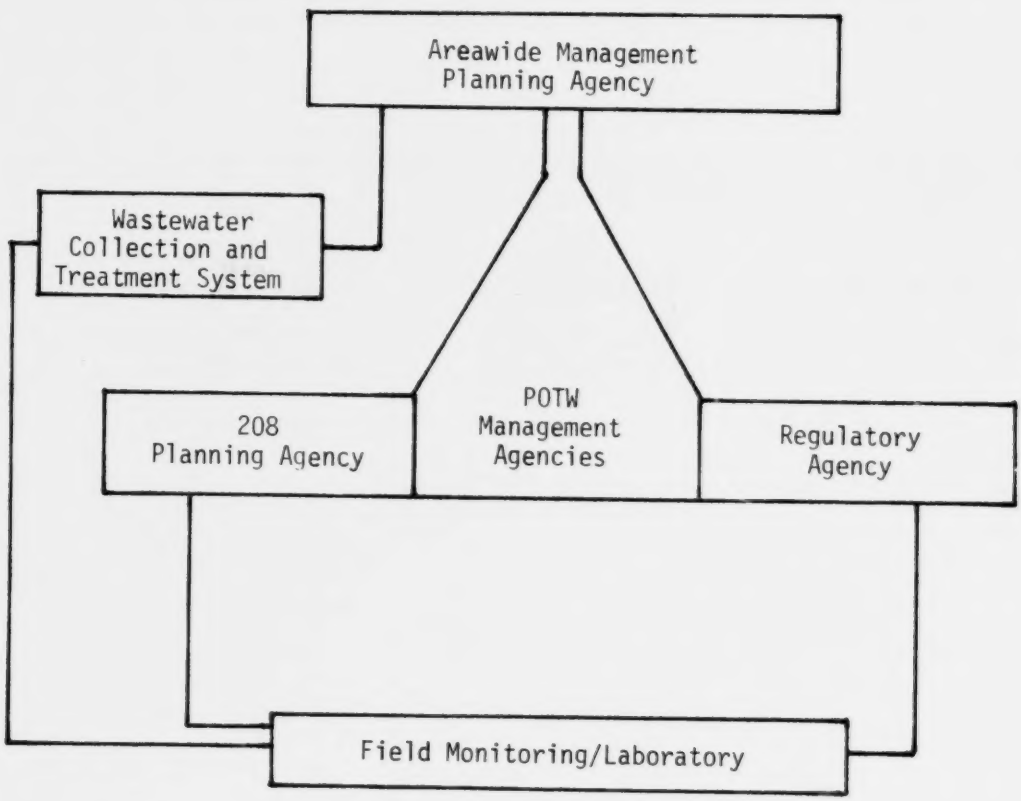
Alternate #2 is basically the same as Alternate #1, except that the institutional structure has been filled in the continuous planning void by introducing a single 208 management planning agency. This management planning agency will play an important role in generating cooperation between various units of local government. Future wastewater planning for municipal areas and the efficient use of public, state and federal funds, to control water pollution programs on a regional level will be accomplished through a single agency.

The I.E.P.A. would continue to be the regulatory agency for municipal point source discharge surveillance in the 208 area.

An evaluation of Alternative #2 indicates that:

1. A continuous management planning process will be executed through 208 agency.

Figure 6
ALTERNATIVE #2



Conceptual Institutional Arrangement
for Municipal Wastewater Control Program

Source: GERP&DC Staff.

2. Planned growth of the systems may lead to the provision of sewer services to municipal residential areas, as well as assist in meeting state and federal effluent standards and water quality goals.

3. The components of the institutional structure already exists in the planning area. The execution of intergovernmental agreements is viewed as a viable mechanism to create the areawide agency.

Alternate #3 Single 208 Operating Planning/Management Agency and Intergovernmental Regional Water Quality Board

Wastewater Facility	Management Action	Management Agency
Sewer System	Plan, finance, construct O&M	Local governments, Areawide Agency
Treatment, disposal re-use	Plan, finance, construct O&M, regulate discharges industrial waste treatment	Areawide Agency
	Regulate through effluent and water quality standard	I.E.P.A.
	Wastewater collection and treatment Construction grants	I.E.P.A.; Fm.H.A.; U.S.E.P.A.
	Land use control, Ordinances, permits, zoning	Local governments Areawide Agency
	Waste load allocation, water quality preservation, lake's watershed development	River conservancy districts, Areawide agency
	Public health, water quality, waste disposal	I.E.P.A.; State health dept.; Areawide agency

Comprehensive Functions	Management Agency
Establish, maintain information system	Areawide Agency
Monitor water quality, point discharges	Areawide Agency; I.E.P.A.
Operate and maintain treatment system, sewer system evaluation, provide technical assistance to local governments	Areawide Agency
Coordinate all management agencies, monitor compliance with plan	Areawide Agency
Provide manpower training for own staff, local government, & industry	Areawide Agency/ I.E.P.A.
Act as consultant to 208 agency in planning and implementation (on contract)	Areawide Agency; Regional Planning Commission

Figure 7 illustrates alternate structure #3.

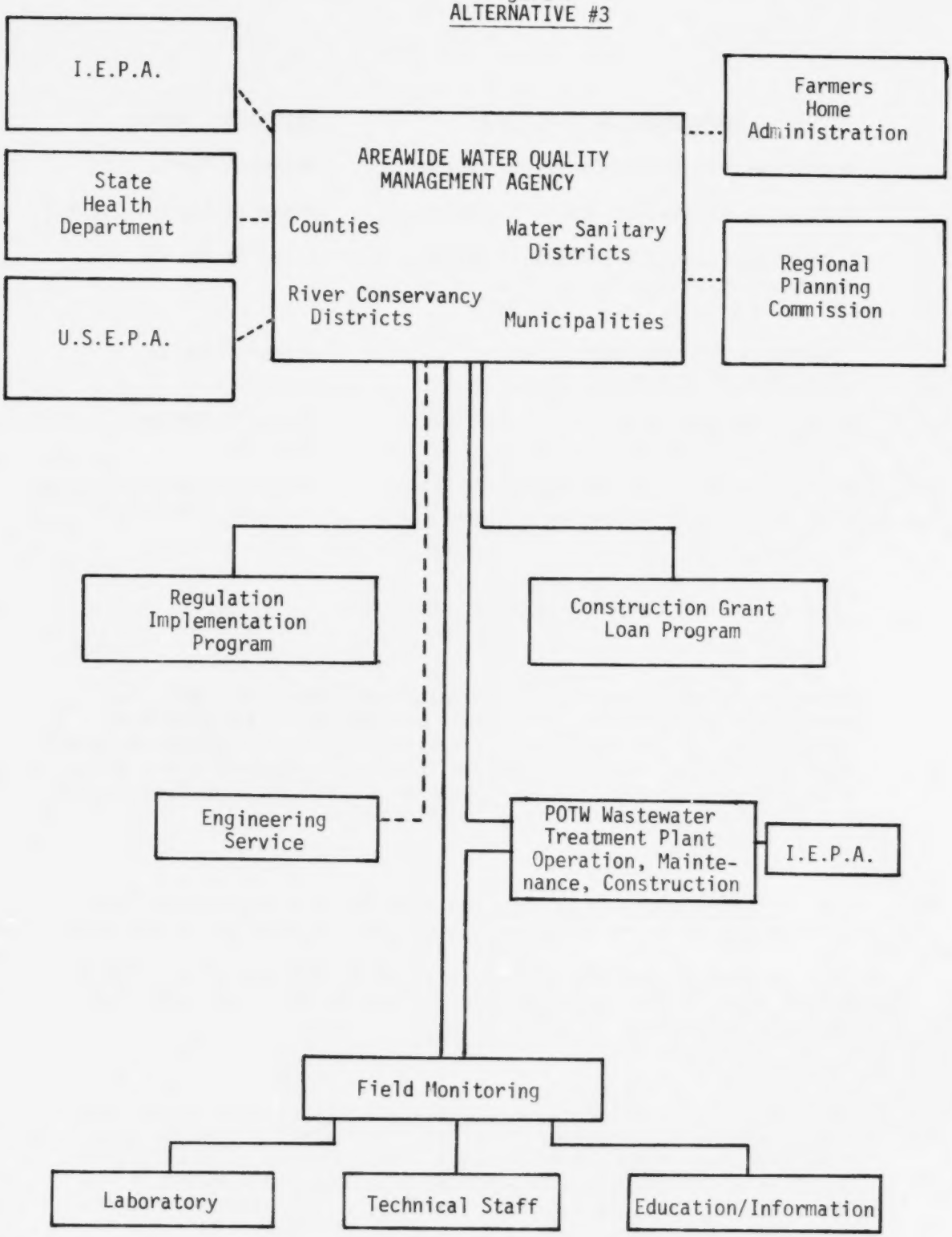
Alternate #3 is a single operating/planning management agency for municipal systems. This agency will be responsible for operating and maintaining all the municipal and sanitary districts' wastewater treatment facilities. The same agency will also be responsible for the planning phase of the management program. The agency can function in one of two ways, depending upon the final plan.

(a) As a sub-agency of an areawide Water Quality Board, which may control all the point and non-point sources of pollution in the area.

(b) In case an areawide Water Quality Board does not exist, then a single Areawide Management Planning Agency may be created just for municipal sources.

In both structures, the representation of units of local government, state, and federal agencies (involved in municipal wastewater collection/treatment systems financially or legally), and regional planning agencies will be required in Areawide Water Quality Agency Board or Water Quality Management Board. Figure 7, illustrating alternative structure #3, shows various agencies which are related to a municipal water pollution control program.

Figure 7
ALTERNATIVE #3



Conceptual Institutional Arrangement
For Municipal Wastewater Control Program

Source: GERP&DC Staff

The management action and responsibilities are similar to Alternative #2 but under a more centralized structure. The 208 Agency would be responsible for administration and coordination with I.E.P.A. and U.S.E.P.A. The Agency will maintain a circuit staff which should provide technical assistance. The institutional arrangement shows that the Areawide Agency has two alternatives for planning and engineering:

(a) On contract, the Agency can utilize the regional planning commission for the planning phase and private engineering firms for engineering services.

(b) The Agency can include the required experts in the staff.

The I.E.P.A. will be the regulatory agency for municipal point source discharge surveillance.

In this management structure, the O&M responsibility of sewer systems will remain with local government units, because of several local and legal problems. The 208 agency will be involved in sewer system evaluation programs to eliminate infiltration/inflow, manhole surcharge, storm sewer discharge, and bypass problems. The 208 agency will implement regulations to control the water pollution from municipal discharges.

Evaluation of Alternate #3:

1. This alternate optimized the regional resources and manpower through a central organization.

2. Municipal wastewater planning needs will be consistent with the state and national water quality goals.

3. Intercity sewer systems will escalate the regionalization potential, which finally will provide sewer services to more population.

4. Institution structure #3 may assume the responsibility for operating and maintaining publicly owned septic tank systems in rural areas of the 208 Southern Illinois area.

5. The waste load allocation program can be implemented through a single operating management agency.

6. Alternative #3 may be cost-effective, which will eventually reduce the user's charges because of efficient use of manpower and resources.

7. The single largest problem of this institutional structure is to create such an organization in the area. Several factors, including acceptibility to local governments, state legislation, cost-benefit comparison, financial arrangements, and environmental benefits, will require detailed evaluation prior to creation of a single 208 Operating Management Agency.

Chapter 3

INDUSTRIAL DISCHARGES

The 208 area possesses a rather modest industrial economy highly characteristic of most rural areas. This chapter identifies the type and distribution of industry as well as assesses the potential impact on regional water quality.

Definition

Industrial wastewater means the liquid wastes resulting from the processes employed in industrial, manufacturing, trade, or business establishments, as distinct from domestic wastes.

Existing Industrial Discharges

The Southern Illinois 208 area is not an industrial region. Except for a few, the industrial operations are small. The Norge Company, which manufactures clothes washers and dryers, is the largest industry; and the General Tire and Rubber Company, which manufactures tires, is the second largest industry in the area. Almost all of the industries are located within the corporate limits of the following cities: Benton, Carbondale, DuQuoin, Harrisburg, Herrin, Marion, Mt. Vernon, Murphysboro, and West Frankfort.

Several areas in the region are designated as industrial parks. These industrial parks range in size from 30 acres to 150 acres. They are listed as follows:

- Fountain Place South (Mt. Vernon)
- Benton Industrial Park (Benton)
- Franklin County Industrial Park (West Frankfort)
- Marion Industrial Park #1 (Marion)
- Marion Industrial Park #2 (Marion)

Table 8
MANUFACTURING INDUSTRIES

Franklin County Industries	Type	City
Petroff Packing Company	Meat Packing	Benton
Smith, Clyde & Son	Meat Packing	Benton
Air Stamping, Inc.	Tools, Dies, Fixtures, etc.	Christopher
Michael-Walters Industries	Lubricants, Grease, Adhesives	Valier
Cable Service Co., Inc.	Electrical Connectors	West Frankfort
M.A.T. Industries, Inc.	Mine Equipment, Repair & Manufacturing	West Frankfort
Mark Twain Marine Industries	Fiberglass Boats	West Frankfort
W. Frankfort Packing Company	Meat Processing	West Frankfort
Jackson County Industries		
General Electric	Tool & Die	Carbondale
Koppers Company, Inc.	Gum, Wood Chemicals, R. R. Ties	Carbondale
New Era Dairy	Dairy Products	Carbondale
Tuck Industries	Pressure Sensitive Tape	Carbondale
Agriculture Chemical Group	Liquid Fertilizer	Murphysboro
Baker's Slaughtering	Meat Slaughtering & Processing	Murphysboro
Bracon Industries, Inc.	Plastic Products	Murphysboro
Consolidated Aluminum Corp.	Aluminum Extrusion & Fabrication	Murphysboro
Leady's Butchering & Processing	Meat Processing	Murphysboro
Jefferson County Industries		
Carlson Quality Die Works	Tools, Dies, Fixtures, etc.	Mt. Vernon
Dowzer Electric	Transformers	Mt. Vernon
General Radiator Division	Radiators & Cores	Mt. Vernon
General Tire & Rubber Company	Radial Tires	Mt. Vernon
Jax Asphalt Company	Asphalt	Mt. Vernon
Midstates Chemical Company	Industrial Paints, Enamels, etc.	Mt. Vernon
Precision National Corporation	Diesel Engines, Parts, etc.	Mt. Vernon
Southern Illinois Asphalt Co.	Asphalt	Mt. Vernon
Stan The Tire Man	Auto Retread	Mt. Vernon
Uncle Charlie Sausage Company	Sausage Processing	Mt. Vernon
Vanex Color, Inc.	Paints & Coating	Mt. Vernon

Table 8 (Cont'd)

Jefferson County Industries	Type	City
Vernois, Inc.	Casting, Procelain, Enamel	Mt. Vernon
Perry County Industries		
Coca-Cola Bottling Company	Beverage	DuQuoin
Country Set, Inc.	Women's Sportswear	DuQuoin
DuQuoin Packing Comany	Meat Packing	DuQuoin
Essex International, Inc.	Motor Vehicle Parts	DuQuoin
Phelps Dodge Cable & Wire Co.	Cable & Wire	DuQuoin
Turco Manufacturing Company	Playground Equipment	DuQuoin
MCA Manufacturing	Phonograph Records	Pinckneyville
Reynolds, R. J. Foods, Inc.	Puddings, Pie Fillings	Pinckneyville
U.S. Gypsum Company	Metal Products	Pinckneyville
Saline County Industries		
El Filters, Inc.	Coils for Industrial Applicators	Eldorado
Eldorado Manufacturing Corp.	Diesel Engine Parts, Plating	Eldorado
Tri-County Chemical, Inc.	Fertilizer Mixer	Eldorado
Venetian Mirror & Glass Co.	Glass & Mirrors, etc.	Eldorado
Raleigh Packing Company	Meat Processing	Raleigh
Williamson County Industries		
American Magnetics Corporation	Specialty Transformers	Carterville
Penzoil Corporation	Oil Blending	Energy
Allen Industries, Inc.	Insulators	Herrin
Container Stapling Corporation	Staples, Stapling & Nailing Machines	Herrin
Diagraph Bradley Industries	Industrial Marketing Products	Herrin
Dura-Plex Industries, Inc.	Plastic Homes	Herrin
Federal Wire Mill	Ferrous Galvanized or Copper Wire	Herrin
Norge Company	Home Laundry, Washers, Dryers	Herrin
Smoler Brothers	Women's Dressing	Herrin
Supreme Plating	Zinc-Cadmium Plating	Herrin
National Transformers Corp.	Electrical Transformers	Johnston City

Table 8 (Cont'd)

Williamson County Industries	Type	City
Reaco Battery Manufacturing Co.	Batteries	Johnston City
American Fiber-Lite, Inc.	Boats, Fiberglass	Marion
Hulbert Oil & Grease Co.	Lubricants	Marion
Marion Pepsi-Cola Bottling Co.	Beverage	Marion
Olin Corporation	Propellant & Pyro-technic Devices	Marion
Trogan U.S. Powder Company	Explosives	Marion
Wilson Asphalt Company	Asphalt	Marion

--There are no significant industries in other counties.

Source: GERP&DC, 1978 Directory of Manufacturers.

Table 9
NPDES INDUSTRIAL DISCHARGES

Map Code No.	IEPA Discharge No.	Plant's Name
1	ATH199-07	Southern Illinois Power Plant
2	NO55-09	Carmet Company
4	NO77-07	Veach Oil Company
5	NC077-08	Baker's Slaughtering
6	NC145-02	U.S. Gypsum Company
7	NC145-04	Decca Records Company
8	NCA055-01	Cable Service Company
9	NDB077-10	Koppers Company
11	NEAA145-01	Phelps Dodge Corporation
12	NEAB145-01	Country Set, Inc.
13	NEB145-02	DuQuoin Packing Co.
14	NFA199-01	Allen Industry, Inc.
15	NJ081-08	Mt. Vernon Fountain
16	NJ081-09	Precision Products
17	NJ081-12	General Tire & Rubber
18	NJC081-01	Mt. Vernon Municipal Airport
19	NZP055-02	Petroff Packing Company
20	I077-01	Central Illinois Power Plant

Source: GERP&DC Staff.

- Carbondale Industrial Park (Carbondale)
- Bicentennial Industrial Park (Carbondale)
- Murphysboro Chamber of Commerce Industrial Park (Murphysboro)
- Saline County Industrial Park #1 (Harrisburg)

A list which shows each industry, its type of business, and its geographical location is in Table 8. It is evident from the table that more than 70% of the area's manufacturing industries discharge their effluent into publicly owned or municipal sewer systems. In the 208 area, 21 dischargers may be classified as industrial discharges. These dischargers are listed in Table 9 and identified on map 2.

Industrial operations and processes create wastes that are peculiar to the product manufactured. The variety of waste types is often quite visible after discharge into the environment: black particles from the rubber industry; red hot water from meat plants; and colored wastes from cleaning and dyeing establishments. To further complicate the picture, new and unknown wastes are produced every year as a result of technological advances in the synthesis of chemical compounds; in the development of new products; and in the application of new manufacturing techniques. The following classification system is used to differentiate the characteristics of industrial waste strength in relation to domestic type waste water (Table 10).

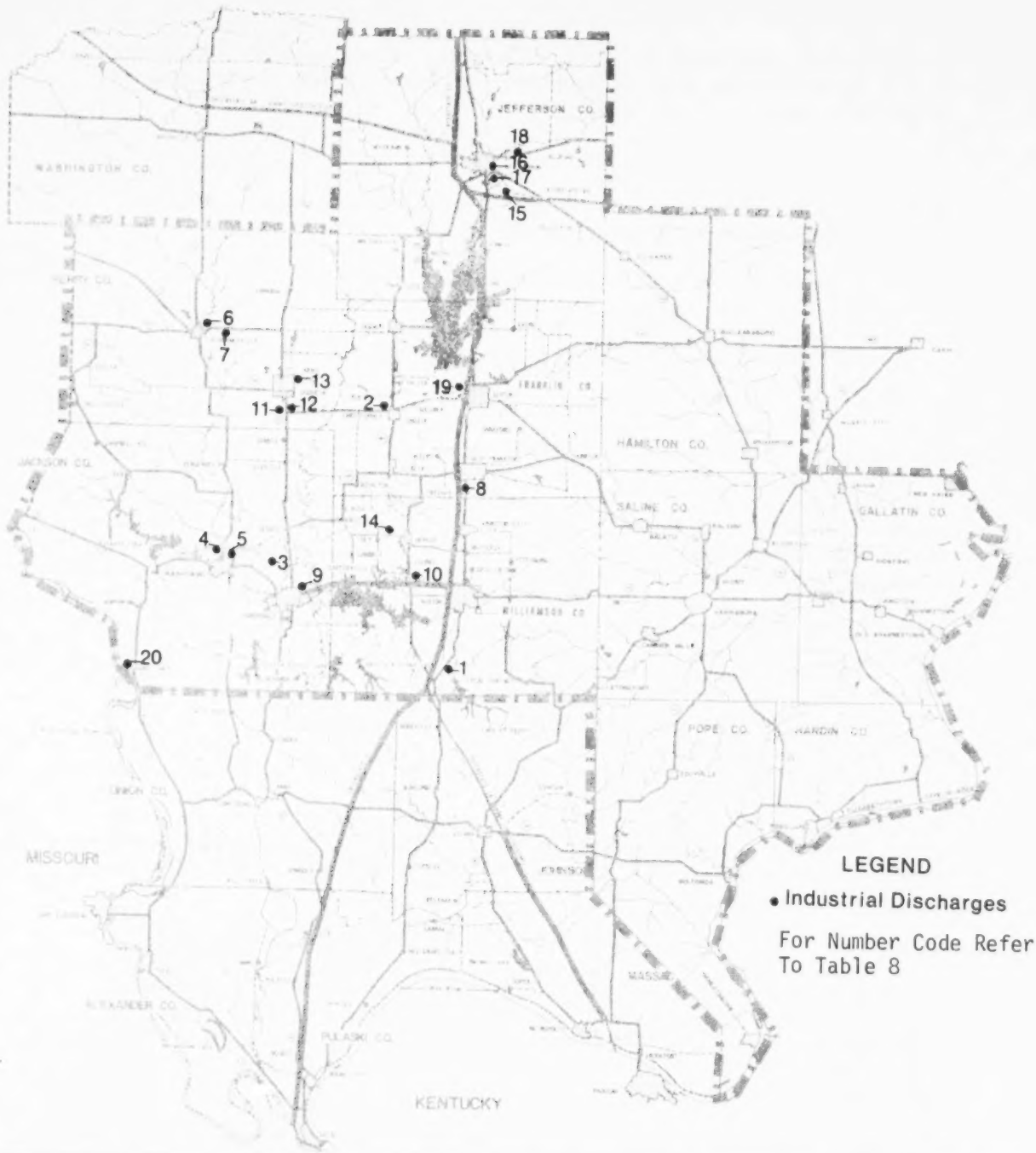
Table 10
CHARACTERISTICS OF INDUSTRIAL WASTE

Waste Constituents	Classification Low	Average	High
BOD_5 mg/l	200	200-300	300-1,000
COD mg/l	300	300-450	450-1,500
SS mg/l	200	200-300	300-1,000
Temp. °C	15	15 25	25
pH	6 (acid)	6- 9	9 (alkaline)

Source: U.S. Environmental Protection Agency. Federal Guidelines-State and Local Pretreatment Programs, Volume I, II, and III. USEPA, Washington, DC 1977.

The wastewater characteristics information is required in order to identify the pre-treatment before discharging it into a municipal sewer.

INDUSTRIAL DISCHARGES



Map 2

NORTH

scale in miles

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

The preparation of this map was financially aided through Federal Grant No. P005225-01 through the U.S. Environmental Protection Agency under the Water Pollution Control Act Amendments of 1972.

If a separate treatment facility is needed, the wastewater characteristics determine the type of treatment processes which can produce an acceptable quality of effluent.

An industry constructs and operates a separate wastewater treatment facility in the 208 area under the following circumstances:

- A sewer system does not exist in the area;
- The municipal wastewater treatment plant does not have the capability to handle the industrial wastes;
- The industry is utilizing the wastewater for land irrigation.

The majority of the industries in the area consume little volumes of water. Therefore, the wastewaters generated from the industries are not processed wastewaters. Such wastewater may be classified as domestic-type wastewater, although its not true in all cases. Industrial raw wastewater analysis records are not available, and it becomes difficult to quantify the problem in case of an accident spill or illegal discharge into the stream. The following types of treatment systems are commonly employed by industries:

- Holding lagoon with land treatment facilities;
- Settling tank, neutralization and filtration;
- Stabilization ponds and effluent disinfection.

No effluent normally results from those industries which re-use wastewater for rural crop irrigation. A large number of industries discharge their wastewaters into municipal sewers for treatment of publicly owned wastewater treatment plants.

Joint treatment of industrial and municipal wastewaters in the same treatment works is generally a desirable practice. Treatment of the combined wastewaters can benefit the environment, the municipality, and the industry if the treatment facility is properly designed and operated. Some of the advantages of joint treatment are as follows:

(a) Increased flow, which can result in reduced ratios of peak to average flows;
(b) Savings in capital and operating expenses, due to the economics of large scale treatment facilities;
(c) Better use of manpower and land;
(d) Improved operation;
(e) Increased number of treatment modules, with resultant gains in reliability and flexibility;

(f) More efficient disposal of sludges, resulting from treatment of wastewater containing compatible pollutants.

In some cases, the characteristics of the industrial wastewaters may be beneficial in the publicly owned treatment works processes. For example, some industrial wastewater contains organic material but is devoid of nutrients required for biological treatment. In joint biological treatment, the nutrients are present in the domestic wastewater and consequently do not have to be added (as they would in separate industrial treatment). For a plant required to remove nutrients, the joint biological treatment of nutrient-free organic industrial wastes would result in lower amounts of nutrients to be removed in a subsequent process. Nutrient removal is essential for the cities of Marion, Mt. Vernon, and other small villages who discharge their effluent into lakes; such a joint system might help in reducing the nitrogen and phosphorous loading. There may be characteristics present, however, which make a wastewater not susceptible to joint treatment if introduced directly into the municipal system. In such cases, it will be necessary to pretreat the industrial wastewater.

There are very few industries in the region which pretreat their wastewater prior to discharge into a municipal sewer system. The city of Carbondale is building a separate centralized industrial wastewater treatment facility. It is a pretreatment-type system, which will reduce the strength of the industrial waste so that it may be treated with domestic wastewater. It may be possible that several industries of the 208 area require pretreatment; but, they cannot be identified due to a lack of industrial wastewater data. According to the federal guidelines, a major contributing industry is an industrial user of the publicly owned treatment works that meets the following criteria:

(a) has a flow greater than five percent of the flow carried by the municipal system receiving the waste;

(b) has a flow of 50,000 gallons or more per average work day;

(c) has in its wastes a toxic pollutant in toxic amounts; or

(d) has a significant impact, either singly or in combination with other contributing industries on a publicly owned treatment works or on the quality of effluent from treatment works.

These industries are required to pretreat their wastewater before it enters into municipal wastewater treatment facility. Waste introduced

into a publicly owned treatment works should not interfere with the operation or performance of the public facilities.

Specifically, the following wastes cannot be introduced into the publicly owned treatment works:

(a) Wastes which create a fire or explosion hazard in the publicly owned treatment works;

(b) Wastes which will cause corrosive structural damage to treatment works, but in no case wastes with a pH lower than 5.0, unless the works are designed to accomodate such wastes;

(c) Solids or viscous wastes in amounts which would cause obstruction to the flow in sewers, or otherwise interfere with the proper operation of the publicly owned treatment works;

(d) Wastes at a flow rate and/or pollutants discharge rate which is excessive over relatively short time periods, so that there is a treatment process upset and subsequent loss of treatment efficiency.

A few industries in the area have dual systems. Such industries discharge their shower room, soil, or domestic type waste into municipal sewers while their industrial wastewater is processed through a separate treatment plant.

Impact on Water Quality

Table 11 shows that 5 of the 21 facilities with an NPDES permit did not have a discharge during the 1975 sampling period. DuQuoin Packing Company and Central Illinois Power Plant re-use the industrial wastewater for land application (spray irrigation); therefore, no discharge was observed at these two industries. The majority of the industries do not meet the state's effluent standards for fecal coli, BOD_5, and suspended solids. Three industries violated other parameters as well. The waste load from these industries could not be determined, as the flow data was not available.

Those industries discharging industrial wastewaters into municipal sewers may indirectly degrade the regional water quality through municipal discharges. If an industry discharges wastes which cannot be

Table 11
INDUSTRIAL WASTEWATER TREATMENT PLANTS DISCHARGES

IEPA Discharge Numbers	Plant	BOD mg/l	Fec. Coli	Amm. N mg/l	Nitrite/ Nitrate mg/l	TSS mg/l	Other Constituents in Excess of IPCB Criteria
ATH199-07	Southern Illinois Power Plant	3.0	0	0.09	0.2	4	Mn
NO55-09	Carmet Company	25.0	534	7.9	0.3	62	
NO77-02	Southern Illinois Airport	550.0	570,000	52.0	0.6	693	
NO77-07	Veach Oil Company	9.7	34	1.1	34.7	2.6	
NCO77-08	Baker's Slaughtering	-	-	-	-	-	
NC145-02	U.S. Gypsum Co.	14.3	0	4.9	29.3	24	
NC145-04	Decca Records Co.	9.1	29,658	3.6	13.5	8	
NDB077-10	Koppers Company	95.0	0	1.7	2.8	90	pH, Mn, Fe, Hg, Phenol
NDE199-01	Williamson County Airport	-	-	-	-	-	
NEAA145-01	Phelps Dodge Corporation	111.0	1,010,000	37.2	5.2	104	
NEAB145-01	Country Set, Inc.	29.0	89,200	13.7	3.9	28	
NEB145-02	DuQuoin Packing Company	-	-	-	-	-	
NFA199-01	Allen Industry, Inc.	24.0	16,000	12.7	13.6	28	
NGA055-01	Cable Service Company	11.0	100	0.4	0.1	24	
NJ081-08	Mt. Vernon Fountain	26.0	300	4.5	0.8	33	
NJ081-09	Precision Products	31.0	400	0.8	1.0	59	
NJ081-12	Gen. Tire&Rubber	28.0	89	0.3	5.7	16	pH
NJC081-01	Mt.Vernon Municiple Airport	-	-	-	-	-	
NZP055-02	Petroff Packing Co	449	2,540,000	42.6	0.1	159	
I077-01	Central Illinois Power Plant	-	-	-	-	-	

-Data is not available or there is no discharge from the facility.
Source: Illinois Environmental Protection Agency Water Quality Network Data.

handled at the municipal wastewater treatment plant or upsets the microorganisms' function in a biological treatment facility, the result will be a poor quality of effluent from the municipal outfall. Several municipalities in the 208 area which receive industrial waste fail to meet state effluent standards. There may be other reasons besides industrial discharge into the municipal sewer systems, but proper documentation of industrial wastewater characteristics is needed in order to assess the potential impact of industrial wastes on the efficiency of municipal wastewater treatment facility.

It is estimated that about 25% to 50% of the existing industrial permitted discharges will be diverted to the municipal wastewater treatment facilities in the near future, because most of the communities with industrial employment are expanding and upgrading their sewage treatment facilities. The city of Carbondale is expecting to treat 0.73 MGD industrial wastes by 1995, where the existing industrial flow in the municipal sewer is approximately 0.2 MGD.

A demonstration coal gasification plant will be in operation near Cutler, in Perry County. This plant will convert Illinois coal into natural gas with sulfuric acid produced as a by-product. Initial employment is estimated to be 400 persons. If this demonstration project is found feasible, then it will be expanded to a commercial level by 1990 with a work force of 2,000 employees. No industrial wastewater will be produced from the coal gasification process. Only domestic type waste is expected from this industry. Expected future industrial growth in the region is limited to small industries. Presently, two industrial parks are in the planning stage: the Saline County Industrial Park #2 (Harrisburg-Raleigh), and the Perry County Industrial Park (Pinckneyville). Future industrial growth in the region is expected to be related to either energy or coal mining equipment activities.

The overall impact of industrial discharges on regional water quality is not anticipated to be significant; however, there may occur locally severe impacts as a result of improper treatment or outbreaks. I.E.P.A. monitors the point source industrial discharges regularly; the 1975 data is summarized in Table 10. As is illustrated in Table 10, most of the identified industrial discharges cannot be distinguished from other types of point sources such as municipal or private discharges; and the resultant water quality is the combined effect of similar types of effluent generated for municipal, private, and industrial wastewaters treatment facilities. Some industrial parameters are detectable near the outfall, but the main water body does not indicate any violation of these parameters in the stream. These treatment facilities should be upgraded to treat the waste in order to bring them up to the required level.

Pollution Control Mechanisms

The water pollution problem from industries can be controlled two ways: in-plant process control and industrial waste treatment technology. In-plant control measures which might reduce or eliminate the need for pretreatment facilities should first be examined, before a pretreatment program is embarked upon. In-plant control also changes the waste characteristics, which can upgrade the existing wastewater treatment facility, if the industry has one. In many circumstances, a thorough examination of plant operational practices, recycling alternatives, and other water conservation or re-use possibilities can significantly reduce pollutant loads.

Industrial discharges into municipal sewers should be evaluated thoroughly. Waste characteristics should be determined by collecting the samples at least during the following activities: regular operation, and floor washing, reactor flushing, machine cleaning, or similar periodical operations.

The operator of a municipal wastewater treatment facility should be familiar with industrial wastes, types of chemical discharges from industry in case of spill or accident, and their impact on a municipal treatment plant's performance. The impact of industrial discharges may be severe, even if the discharge is in low quantity. The important factor is the characteristic of the waste discharged into a municipal system. As stated before, industrial cities of the study area in the process of upgrading their wastewater treatment facilities. This will be completed within the next two years. If, after the completion of these facilities, the effluent quality does not meet the state standards, the I.E.P.A. should take regulatory action against these municipalities and industries.

The degree of industrial wastewater treatment is the function of final disposal. If the industrial waste is discharged into a municipal sewer, then the wastewater characteristics should be analyzed to evaluate the pretreatment option. Pretreatment consideration may differ, depending on whether the pollutants to be controlled are susceptible to treatment in a publicly owned treatment works. For compatible pollutants, pretreatment would generally be employed because it is the most cost-effective alternative or because the POTW does not have available design capacity to treat the wastes. A variety of processes are available for pretreatment of industrial discharge into municipal sewer, including the following:

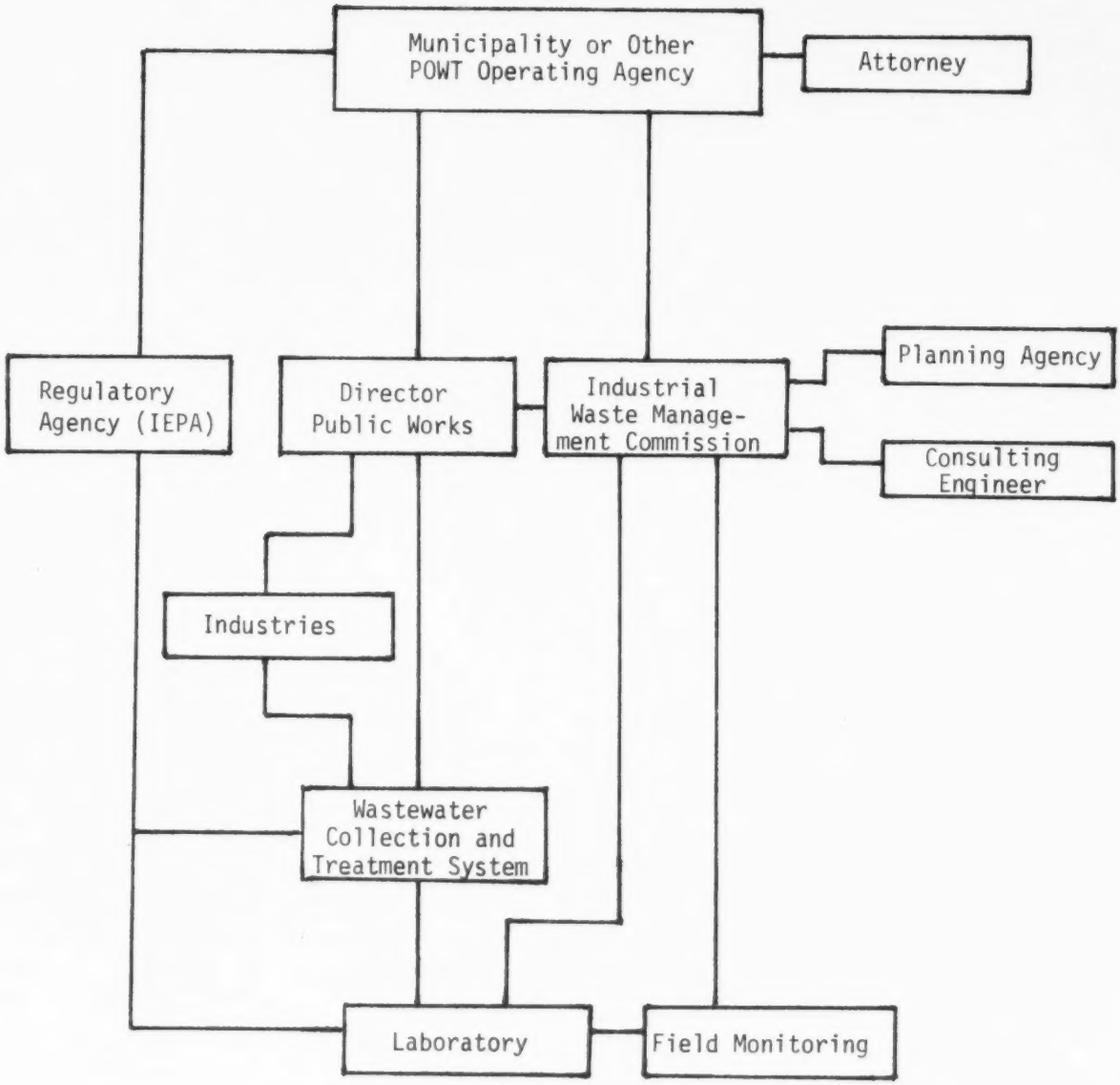
- Coarse solids separation;
- Grit removal;
- Equalization;
- Neutralization;
- Dissolved air flotation;
- Sedimentation;
- Filtration;
- Chemical precipitation and coagulation;
- Activated carbon adsorption;
- Chemical conversion;
- Biological treatment.

In summary, pretreatment must be evaluated on a case-by-case basis within the context of cost-effectiveness and applicable technical factors. In case the industry discharges the wastewater into the environment, the effluent should meet the industry's NPDES permit requirement. A large number of industrial wastewater treatment alternatives are available. The selection of a particular process unit is constrained by several factors, such as characteristic of wastes; quantity of wastewater; degree of treatment required; and cost-effectiveness.

The I.E.P.A. as a state regulatory agency limits its activities to issuing NPDES permits and periodically collecting samples from the industrial effluent. It appears that little effort had been exerted to implement the effluent standard or pretreatment requirements. The majority of the municipalities in the area do not have a sewer ordinance. The existing sewer ordinances in the area do not adequately address the industrial discharges into the municipal system. The municipalities apparently are not aware of the impact of industrial discharges on their municipal treatment systems or of pretreatment requirements. Neither do these municipalities have regulating/implementing programs for industrial waste control. The ordinance is the heart of any industrial pollutant control program, providing the essential mechanism for controlling the discharges from industries within the publicly owned treatment works (POTW) systems. A significant preliminary step to control industrial waste in the 208 area would be to undertake an industrial waste survey to obtain necessary wastewater data, as well as inventory the type of chemicals used in the respective manufacturing processes.

Section 208(b)(2)(c)(iii) provides for the establishment of a regulatory program to assure that any industrial or commercial wastes discharges into any treatment works in such areas meet applicable pretreatment requirements. A typical organizational structure for an industrial wastewater control program is presented in Figure 8. The municipalities, sanitary districts, or any other publicly owned wastewater treatment plant operating agencies will assume full responsibilities of carrying out such a program with the cooperation of the regulatory agency.

Figure 8
TYPICAL ORGANIZATIONAL STRUCTURE FOR AN
INDUSTRIAL WASTEWATER CONTROL PROGRAM



The wastewater discharges into publicly owned treatment works.

Source: GERP&DC Staff

Pretreatment requirements, where necessary, will be included as part of the municipal ordinance. The management agency should allocate the waste load/hydraulic capacity of the municipal wastewater treatment plant for future public need and industrial growth in the facilities planning area.

Chapter 4

PRIVATE POINT SOURCE DISCHARGES

Private point sources of pollution within the area include those facilities which serve recreational sites, schools, subdivisions, mobile home parks, and other developments not connected to a publicly owned treatment works.

Definition

A private discharge may be defined as a source of wastewater discharge through a pipe, culvert, or other means, from commercial, institutional, or residential sources. The classifications may be further defined as follows:

Commercial:	shopping centers, stores, restaurants, offices, service buildings, etc.;
Institutional:	schools, churches, parks, campgrounds, government, etc.; and
Residential:	mobile home parks, subdivisions, apartments, etc.

An NPDES permit is required by the I.E.P.A. to operate the facility by an individual private discharger if the wastewater flow is 15 P.E. (population equivalent) or 1,500 gallons per day or more.

Existing Private Point Sources

The distribution of the private point sources of pollution within the area is uneven and appears for the most part to be reflective of rural sprawl. Permits issued by the state for these sources are grouped by classification and major drainage basin in Table 12.

Table 12
CLASSIFICATION OF PERMITTED PRIVATE
POINT SOURCE DISCHARGES

	Commercial	Institutional	Residential	Totals
Big Muddy Basin	9	25	72	106
Saline-Ohio Basin	4	6	12	22
Totals	13	31	84	128

Source: GERP&DC Staff.

Most of the private point sources employ either (1) lagoons or (2) septic tanks with recirculating or buried sand filters to treat the collected wastes. Several facilities utilize a small package treatment plant system. It is estimated that approximately one-third of the private systems have no discharge as a result of over-designed lagoon capacity; lagoon evaporation and/or infiltration into the ground; and plant oversizing due to the 100 gallon per day per person criterion where actual wastewater generation may be as low as 40 gallons per person per day.

The wastewater produced is basically of domestic strength. Influent varies dependent upon the type of activities serviced, i.e., mobile home parks vs. churches or schools.

Impact on Water Quality

Analysis of I.E.P.A. stream monitoring data compiled for the period 1972-1975 indicates that the fecal coli standard is consistently violated. The cause of high fecal coli counts may be the result of a combination of sources, i.e., feedlot operations; rural sewage; and municipal point sources as well as private point source discharges.

The effluent data contained in Table 13 indicates that most of the discharges do not meet the state effluent standard, especially with respect to fecal coli and total suspended solids. These violations may be partly the result of (1) lack of chlorination units and/or inadequate chlorination; (2) combined effect of duck weeds and/or algae affecting suspended solids in the effluent; and (3) improper maintenance of sand filters.

Table 13
PRIVATE WASTEWATER POINT SOURCE DISCHARGES
IN 208 AREA (1975 EFFLUENT DATA)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L Lbs/Day	Nitrite Nitrate MG/L Lbs/Day	TSS MG/L Lbs/Day
SALINE-OHIO RIVER BASIN						
A 151-02	Golconda Job Corps	88.83 16.30	75,587	3.50 0.64	17.29 3.17	101.00 18.65
AJD 151-02	Lake Glendale Beach (1974 Data)	6.00 ---	0 ---	0 ---	0 ---	9.00 ---
AJD 151-03	Lake Glendale Camp (1974 Data)	39.00 ---	0 ---	4.50 ---	0 ---	18.00 ---
AJDA151-01	Dixon Springs State Park	1.00 .17	100 ---	.50 .08	24.50 4.09	0 0
AJFA087-01	Mount Shelter Care	64.71 ---	428,500 ---	19.54 ---	1.60 ---	114.00 ---
AJG 151-01	Shawnee Shelter Care HM	35.33 ---	22,000 ---	4.93 ---	.33 ---	40.00 ---
AKA 151-01	Golconda Elem. School	28.00 1.63	53,000 ---	24.00 1.40	45.50 2.66	24.00 1.40
ARB 069-01	Comm. Consol. Sch. No. 2 (1974 Data)	35.00 0.85	69,950 ---	28.25 0.68	20.50 0.50	30.00 0.73
AT 059-03	Williams Motel	485.00 28.30	14,275,000 ---	11.43 0.67	.18 0.01	137.50 8.03
ATE 059-01	U.S. Forest Serv.-Pounds	1.00 ---	28,000 ---	.20 ---	35.00 ---	2.00 ---
ATFE165-01	Hillcrest School-99	5.00 1.25	1,600,000 ---	6.00 1.50	39.00 9.76	31.00 7.76
ATGD165-01	Gallatia High School (1974 Data)	18.00 ---	137,366.67 ---	4.17 ---	1.60 ---	10.33 ---
ATGD165-03	Saline Co. HSNG Auth. (1974 Data)	13.00 0.76	123,500 ---	7.50 0.44	16.00 0.93	84.00 4.90
ATH 199-01	Southern Ill. Power Coop.	7.50 0.04	6,400 ---	7.90 0.04	38.30 0.20	5.00 0.03
ATH 199-02	Arnold View School No. 3 (1974 Data)	35.00 2.04	200 ---	7.00 0.41	17.00 0.99	790.00 46.12

Table 13 (Continued)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L Lbs/Day	Nitrite Nitrate MG/L Lbs/Day	TSS MG/L Lbs/Day
SALINE-OHIO RIVER BASIN (CONTINUED)						
ATH 199-08	Lake of Egypt Club (1974 Data)	93.20 ---	7,880 ---	19.72 ---	14.20 ---	19.00 ---
BIG MUDDY RIVER BASIN						
N 055-11	Corps of Engineers	6.00	300	0.07	11.20	3.00
	Rend Lake	.05	---	0	0.09	0.03
N 077-03	Jackson Co. Club	5.50 0.18	30,350 ---	1.40 0.05	20.50 0.68	2.00 0.07
N 077-11	Suburban Trailer Court	8.00 0.20	9,800 ---	1.61 0.04	5.50 0.14	137.00 3.43
N 077-13	Fairway Mobile Home	44.00 .52	1,400 ---	4.35 0.05	0.40 0.005	56.00 0.66
N 077-14	Hillcrest Village STW	15.00 0.23	300,000 ---	17.00 0.27	8.00 0.13	290.00 4.53
N 081-14	Rend Lake College	3.73 8.71	236 ---	0.39 0.91	9.89 23.10	20.00 46.70
NA 077-01	Orchard Hill School	90.00 0.75	885,000 ---	16.90 0.14	72.25 0.60	19.00 0.16
NC 077-01	McElwain School 186	6.00 ---	16,500 ---	13.30 ---	50.45 ---	4.50 ---
NC 077-05	Green Trees Mobile Home	70.00 1.17	330,000 ---	14.00 0.23	1.90 0.03	30.00 0.50
NC 077-06	Country Circle Tr. Pk. (1974 Data)	18.00 0.75	550 ---	0.78 0.03	0.75 0.03	622.00 25.90
NC 077-09	Elverado Comm. Unit School	9.00 0.15	23,000 ---	56.00 0.93	16.00 0.27	9.00 0.15
NC 145-05	Consol. Midw DIV-CTL	13.08 0.33	29,564 ---	9.66 0.24	33.53 0.84	12.00 0.30
NCA 077-01	Mona Williams Tr. Pk.	36.00 0.90	7,100 ---	2.70 0.07	0.30 0.01	42.00 1.05
ND 077-01	Chucks Country Ests.	12.00 0.13	2,233 ---	0.88 0.01	0.33 0.004	28.00 0.31

Table 13 (Continued)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L / Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L / Lbs/Day	Nitrite Nitrate MG/L / Lbs/Day	TSS MG/L / Lbs/Day
BIG MUDDY RIVER BASIN (CONTINUED)						
ND 077-03	Save-Mart	32.00	8,450	23.18	13.00	88.00
	Dept. Store	4.27	---	3.09	1.73	11.79
ND 077-05	Crab Orchard	31.00	12,500	8.25	0.14	66.00
	Lake MH	4.91	---	1.31	0.02	10.50
ND 077-06	SAN PAT	21.00	0	3.66	0.40	40.00
	Apartments	2.94	---	0.51	0.06	5.60
ND 077-07	Seventh Day					
	Advent Church	26.00	26,110	7.10	26.37	14.00
	(1974 Data)	1.30	---	0.35	1.32	0.70
ND 077-09	University	32.00	55,750	9.84	0.63	32.00
	Hts. Mobl. Hm.	6.62	---	2.00	0.13	6.62
ND 077-10	Bush Mobile					
	Homes No. 2	76.00	864,840	17.42	2.66	67.00
	(1974 Data)	1.47	---	0.34	0.05	1.30
ND 077-11	Tan-Tara M.					
	H. #2	6.00	3,020	0.17	4.14	19.00
	(1974 Data)	0.61	---	0.017	0.42	1.92
ND 077-12	Country	39.00	123,700	7.70	16.73	9.00
	Village Apts.	1.03	---	0.21	0.44	0.24
ND 199-03	Crab Orchard	2.00	24,300	7.00	5.66	6.00
	Refuge	8.34	---	29.20	23.60	25.00
ND 199-05	Hickory Leaf	7.00	8,620	5.28	26.20	5.00
	Tr. Pk.	0.29	---	0.22	1.09	0.21
ND 199-09	Greenbriar	23.00	0	4.00	0.15	36.00
	Trustee	2.90	---	0.50	0.019	4.50
ND 199-18	University					
	Estates Tr.					
	Pk. (1974	24.00	73,100	5.60	9.50	33.00
	Data)	---	---	---	---	---
ND 199-19	Logan, John	10.00	136,000	3.25	8.90	8.00
	A., College	1.83	---	0.60	1.63	1.47
ND 199-26	Hoc Briar					
	Tr. Pk.	20.00	100	0.80	0.20	65.00
	(1974 Data)	1.00	---	0.04	0.01	3.25
NDA 077-02	Green Acres	31.00	64,200	5.93	0.67	43.00
	Court-LGN	1.46	---	0.28	0.03	2.02
NDA 077-04	Union Hills,	16.00	67	5.10	0	6.00
	Inc.	4.67	---	1.50	0	1.75
NDA 077-06	Sunshine MHP	5.00	133	0.03	0.07	15.00
		0.15	---	0.0009	0.002	0.45
NDA 077-07	SIU-Office	29.00	2,500	1.00	0.10	48.00
	& Storage	0.24	---	0.01	---	0.40

Table 13 (Continued)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L Lbs/Day	Nitrite Nitrate MG/L Lbs/Day	TSS MG/L Lbs/Day
BIG MUDDY RIVER BASIN (CONTINUED)						
NDA 199-01	Crab Orchard HI & GRD Sch.	2.00	4,800	0.40	8.50	5.00
	(1974 Data)	0.57	---	0.11	2.40	1.42
NDB 077-04	Jackson Tr. Ct. (1974	34.00	18,000	3.50	0.10	140.00
	Data)	0.217	---	0.02	0.0006	0.90
NDB 077-06	Lincoln	56.00	188,500	8.14	6.27	16.00
	Village	2.28	---	0.33	0.26	0.65
NDB 077-07	Mt. Pleasant	25.00	1,730	7.53	0.13	78.00
	Tr. Pk.	0.30	---	0.09	0.002	0.93
NDB 077-09	Shamrock	15.00	41,400	2.70	17.60	22.00
	Apartments	0.18	---	0.027	0.21	0.26
NDB 077-12	Robinson Tr. Pk.	11.00	1,400	2.30	0.20	50.00
	(1974 Data)	0.09	---	0.02	0	0.42
NDC 077-01	Cedar Lane Tr. Pk.	28.00	18,000	6.00	0.10	42.00
	(1974 Data)	1.68	---	0.36	0.006	2.53
NDC 077-02	Lakeland Hills Subd.	10.00	1,600	3.10	0.30	9.00
		1.50	---	0.47	0.05	1.35
NDC 077-04	Pleasant Valley	14.00	133	0.20	0.20	49.00
	Tr. Pk.	0.62	---	0.009	0.009	2.20
NDC 077-05	Unity Point School 140	21.00	0	0.33	1.90	39.00
		0.53	---	0.008	0.048	0.98
NDC 077-06	Pleasant Hill Tr. Pk.	20.00	2,950	1.65	0.45	36.00
		1.75	---	0.14	0.04	3.15
NDC 077-07	Frost Tr. Ct.	14.00	300	0.60	0.85	11.00
		0.66	---	0.03	0.04	0.52
NDC 077-08	Roxanne Tr. Ct.	34.00	367	0.48	0.37	30.00
		3.13	---	0.04	0.03	2.77
NDC 077-10	Giant City Picnic (1974 Data)	21.00	1,700	37.00	33.50	41.00
		---	---	---	---	---
NDC 077-11	Wildwood Mobile Home	14.00	1,540	1.73	0.74	24.00
	(1974 Data)	1.10	---	0.14	0.058	1.88
NDC 077-12	Chateau Apts.-Hilton	22.00	1,000	0.10	0.10	38.00
		0.30	---	0.0013	0.0013	0.50
NDC 077-13	Malibu Village Inc.	23.00	425	0.07	0.18	46.00
		3.64	---	0.01	0.028	7.27
NDC 077-14	Town-n-Country Trail	23.00	126,000	2.05	2.04	34.00
		3.77	---	0.34	0.34	5.57

Table 13 (Continued)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L Lbs/Day	Nitrite Nitrate MG/L Lbs/Day	TSS MG/L Lbs/Day
BIG MUDDY RIVER BASIN (CONTINUED)						
NDC 077-15	Bush Mobile	16.00	16,300	14.25	12.98	13.00
	Homes No. 1	0.38	---	0.33	0.30	0.30
NDC 077-16	Warrens Mobile	64.00	1,400,000	7.28	1.32	25.00
	Home	2.03	---	0.23	0.042	0.80
NDC 077-18	Southern Mobile	25.00	1,130	5.48	0.20	21.00
	Home Pk.	3.89	---	0.85	0.03	3.35
NDCB077-01	Giant City	36.00	7,400	29.00	0.05	21.00
	Lodge	0.60	---	0.48	0	0.35
NDCB077-02	SIU Little Grassy Lake	6.00	9,300	0.14	2.95	26.00
	(1974 Data)	1.90	---	0.04	0.93	8.24
NDDA077-01	Giant City Campground	50.00	125,000	17.45	39.25	116.00
	(1974 Data)	4.17	---	1.46	3.27	9.67
NDH 077-01	Edgewood MH	14.00	5,780	5.65	20.23	8.00
	Est.-STK	---	---	---	---	---
NE 055-01	Mulkeytown School 32	14.00	41,100	15.70	9.43	74.00
	(1974 Data)	0.23	---	0.26	0.16	1.23
NE 189-02	Dubois Center	22.00	100	1.40	0.10	110.00
	Chur. Camp	0.73	---	0.046	0.003	3.67
NEB 145-03	Tamaroa High	39.00	210,000	14.65	17.06	644.00
	Sch. 102	2.28	---	0.85	1.00	37.60
NG 199-01	Lincoln Grade Sch-1	265.00	138,000	14.90	32.33	116.00
	(1974 Data)	---	---	---	---	---
NGA 199-02	Ernfelt Home	41.00	14,200	3.52	0.36	99.00
		1.71	---	0.15	0.02	4.13
NH 055-04	Sullivan-Rend Lake	23.00	9,820	1.90	0.26	32.00
	Tr. Pk.	0.96	---	0.08	0.01	0.35
NJ 081-03	Field Comm.	34.00	111,000	14.55	47.17	23.00
	Consol. Sch.	---	---	---	---	---
NJ 081-04	Dodds Comm.	47.00	14,100	69.00	11.05	51.00
	Consol. Sch.	---	---	---	---	---
NJ 081-10	Eblin Tr. Pk.	26.00	125	3.93	0.23	31.00
	Mt. Vernon	---	---	---	---	---
NZL 077-01	Lake Chautauqua	14.00	250	0	0.40	21.00
	Subd.	0.28	---	0	0.008	0.42

Table 13 (Continued)

I.E.P.A. Discharge Number	Facility	BOD-5 MG/L Lbs/Day	Fec Coli Per 100 ML	AMM-N MG/L Lbs/Day	Nitrite Nitrate MG/L Lbs/Day	TSS MG/L Lbs/Day
BIG MUDDY RIVER BASIN (CONTINUED)						
NZL 077-02	Fairway	10.00	3,100	6.70	0.20	13.00
	Vista	0.28	---	0.19	0.006	0.37
NZM 055-01	Zeigler-Royalton	29.00	333	0.85	0.17	75.00
	HS	3.14	---	0.09	0.02	8.13
NZN 055-02	Bates Campground-STK	40.00	6,700	1.80	5.00	30.00
		1.67	---	0.08	0.21	1.25
NZD 055-01	Franklin Co. Hsng. Auth.	70.00	700,000	9.50	0.50	140.00
		2.34	---	0.32	0.02	4.67
NZU 081-01	Waltonville Grade Sch.	68.00	62,500	1.97	11.76	112.00
		---	---	---	---	---
NZU 081-02	Waltonville High Sch.	5.00	5,880	3.34	46.72	30.00
		---	---	---	---	---
NZU 081-04	Archway Tr. Pk.-Mt. Vernon	14.00	1,130	5.18	14.45	43.00
		---	---	---	---	---

Note: Under BOD-5, Ammonia-N, Nitrite - Nitrate and Total Suspended Solids the top figure is mg/l and the bottom is lbs/Day.

Source: Table developed by GERP&DC Staff based on Illinois Environmental Protection Agency 1975 Water Quality Network Data.

Since all stream monitoring stations reflected adequate dissolved oxygen standards, it is surmised that effluent impacts on streams may be highly localized. Stream impacts regarding the total suspended solids by private point source discharges appears minimal versus others (agreculture, mining, etc.). The fecal coli standard is currently being considered for major revision, and may apply in the future only to public bathing waters and public/food processing water supplies.

Pollution Control Mechanisms

The principal problem of private point source discharges appears to be their failure to consistently meet state effluent standards. The major effort to resolve this issue lies in more effective operation and maintenance of existing systems. However, a number of private point source discharges are located within the facility planning area of municipalities, and may be linked into the municipal systems within the 20-year planning period. Specifically, the larger private discharges along the major growth corridors within one mile of Carbondale, Marion, Murphysboro, Mt. Vernon and Harrisburg are expected to be served by those municipal systems through annexation by 1990.[1]

Improved operation and maintenance procedures include: (1) chemical applications to control duck weed and algae growth in lagoons; (2) regular septic tank pumpage; and (3) sludge cake removal from the top of sand filters. Lagoon effluent may be treated by utilizing submerged sand/rock filters; overland flow application; spray irrigation; and/or maintaining adequate disinfection procedures. Discharges of the effluent may, depending on their location, be conveyed to municipal systems by either interceptor lines or overland transport.

Nonstructural controls constitute a viable alternative to controlling proposed private point source discharges. Those controls include, but are not limited to: (1) in the absence of county ordinances, establishing land use and subdivision ordinances within 1½ miles of corporate limits by municipalities; (2) instituting a policy of limiting the number of taps on rural water distribution lines and thereby control sprawl; and (3) establishing private system criteria in conjunction with a building permit program.

FOOTNOTES FOR CHAPTER 4

[1]The reader is referred to the individual facility plans for the communities cited.

Chapter 5

FEEDLOTS

The 208 area contains a number of livestock operations which are not subject to regulatory programs administered by the state. These two types of operations have been addressed in the report entitled Sources of Pollution: Agriculture.

Definition

A livestock feedlot is defined as "any fenced pen, yard, or uncovered area in which an area less than or equal to 600 square feet is provided for each 1,000 pounds live weight contained therein; in which livestock are enclosed at any one time and fed at or near the place of confinement, and crop or forage growth or production is not sustained in the area of confinement. This does not include land used for the growing of crops or vegetation for livestock feeding."[1]

Existing Feedlots Systems

There exists within the area one NPDES permitted livestock feedlot, located in Perry County, Illinois. A number of other livestock facilities containing fewer animal units are distributed elsewhere in the area. As a general rule, these activities do not require a permit except as specified under Rule 203 of the Livestock Waste Regulations.

Two other livestock facilities should be noted: (1) a confined feeding area near Galatia, Illinois where 25,000 chickens and 75 sows are housed; and (2) a proposed new feeder cattle operation north of Ridgway which will handle 15,000 head. The latter operation will require an NPDES permit.

Feedlot wastes are generated from bedding or litter (if used) and animal hair or feathers; water and milking center wastes; spilled feed;

undigested or partially digested food or feed additives; digestive juices; biological products of metabolism; micro-organisms from the digestive tract; cells and cell debris from the digestive tract wall; and residual soil and sand. Raw wastewater characteristics generated from feedlot are shown in Table 14a.

The permitted livestock feedlot in Perry County maintains approximately 7,000 head per year with about 35% of the confined area under roof. The manure is removed two to three times per year whereas runoff is collected by three settling ponds prior to pumping to an 8 acre storage lagoon.

No discharge occurs except for occasional overflow resulting from rainfall in excess of the 25-year, 24-hour storm (5.6"/24 hours). The livestock waste holding lagoon is also utilized for wastewater from a nearby meat packing firm. Lagoon effluent is sprayed on cropland when volumes are sufficient. The water quality monitoring wells near the spray irrigation sites reflect no impacts on groundwater quality.

Impact on Water Quality

Livestock produce wastes which, when properly used, supply nutrient and organic matter to soils. The mere presence of livestock waste in a given location does not denote pollution, but may, when improperly stored, transported, or disposed of, affect the environment undesirably. Improper construction, establishment, and operation of certain livestock management facilities and livestock waste-handling facilities can cause a water pollution problem.

An improperly designed and malfunctioning feedlot facility can degrade the water quality. One such facility, which is now closed down, was located in the Rend Lake watershed near Waltonville. The feedlot had 1,200-1,500 hogs in a confined area. The runoff was draining into a lagoon and often overflowed. THe quality of the effluent and the water samples taken downstream from the lagoon (as shown in Table 14b) resulted in regulatory action by the state.

The wide distribution of small feedlots constitute a nonpoint source of pollution. Analysis of water quality data indicates that fecal coli counts in excess of stream standards. However, fecal coli may also be

Table 14a
RAW WASTEWATER CHARACTERISTICS FROM FEEDLOTS

Waste Parameter mg/l	Beef Cattle Runoff	Swine Manure	Swine Runoff	Poultry Waste
BOD	1,700	2500 - 20,000	100	500 - 800
TSS	35,000	9,000	260	450 - 800
Total Nitrogen	200	300	20	-
Ammonia Nitrogen	70	900 - 3,000	10	-
Total Phosphorous	90	400	5	-

Source: U.S. Environmental Protection Agency. Federal Guidelines-State and Local Pretreatment Programs, Vol. I, II, and III. USEPA, Washington, DC 1977.

Table 14b
FEEDLOT (HOGS) LAGOON OVERFLOW AND STREAM QUALITY

Parameter	January 8, 1973			November 21, 1973		
	At Property Line	600 Feet Downstream	1/2 Mile Downstream	At Property Line	600 Feet Downstream	1/2 Mile Downstream
NH_4 mg/l	303	400	-0-	1,200	400	120
TSS mg/l	-0-	-0-	-0-	12,000	15,000	400
BOD mg/l	2,400	2,500	-0-	22,000	2,700	560
Coliform Colonies/ 100 ml	1,100,1,000	2,300,000	-0-	1,700,000	1,700,000	1,700,000

Source: Illinois Environmental Protection Agency Water Quality Data, 1973.

attributed to municipal and private point source discharges. In general, feedlot point source discharges within the area have highly localized, if any, impacts on water quality.

Pollution Control Mechanisms

A number of methodologies are available for control of feedlot point source dischages. In-plant processes include composting and drying of manure; pyrolysis; recovery of by-products; and instituting runoff control to lagoons.

Treatment options include land disposal as well as spray irrigation; constructing oxidation ditches; activated sludge processes; and aerated lagoons. The majority of these systems require not only a capital cost, but a continuing operating and maintenance cost.

Overland flow through a grass filter field from a holding tank appears promising as well as economical. Recent experiments seem to prove its overall efficiency. There remains some question concerning the effectiveness of the system during cold winter months.

It appears that the current regulatory program administered by the State of Illinois is sufficient. However, the drainage basins of major water supply lakes and/or recreational lakes may require an evaluation of current animal unit criteria by the state, coupled with a regular monitoring program.

FOOTNOTES FOR CHAPTER 5

[1]Illinois Pollution Control Board, Rule 103, Chapter 5 Livestock Waste Regulations. Springfield, Illinois, 1974.

Chapter 6

DISCHARGES FROM WATER TREATMENT PLANTS

Water treatment plants constitute another type of point source pollution through their generation of waste water in the water treatment process for domestic and industrial use. The waste characteristics depend on both raw water quality and the treatment process.

Definition

The discharges from water plants are classified as follows:

Sludge: highly concentrated suspended solids of raw water plus added chemicals from a sedimentation tank or clarifier.

Filter Backwash Water: fine suspended materials collected in the filter run. In the backwash water, the concentration of solids is low.

Regeneration Waste: Discharge during zeolite ion exchanger regeneration process. Approximately 10% concentrated brine (NaCl) and some filtered suspended solids are present in the discharge.

Existing Water Supply Treatment Systems

Approximately 97% of the 77 communities and 27 public water districts depend upon surface water supplies. Rend Lake, Kinkaid Lake, and Cedar Lake constitute the major water supply sources in the 208 area. Most of the raw water sources of the region can be rated "good," although the general water quality of the streams may be poor.

The quality of raw water varies greatly from source to source. Accordingly, the type of treatment needed to produce a safe and palatable water will vary.

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There are 25 water treatment plants within the 208 area (Map 3) serving these communities and water districts.

The pollutants characteristics vary from plant to plant and from process to process. The most important factor is the source of raw water supply: surface water, such as lake, channel impoundment, and river; ground water, such as rock well and drift well. The pollutants discharged into the streams of study area can be summarized as follows:

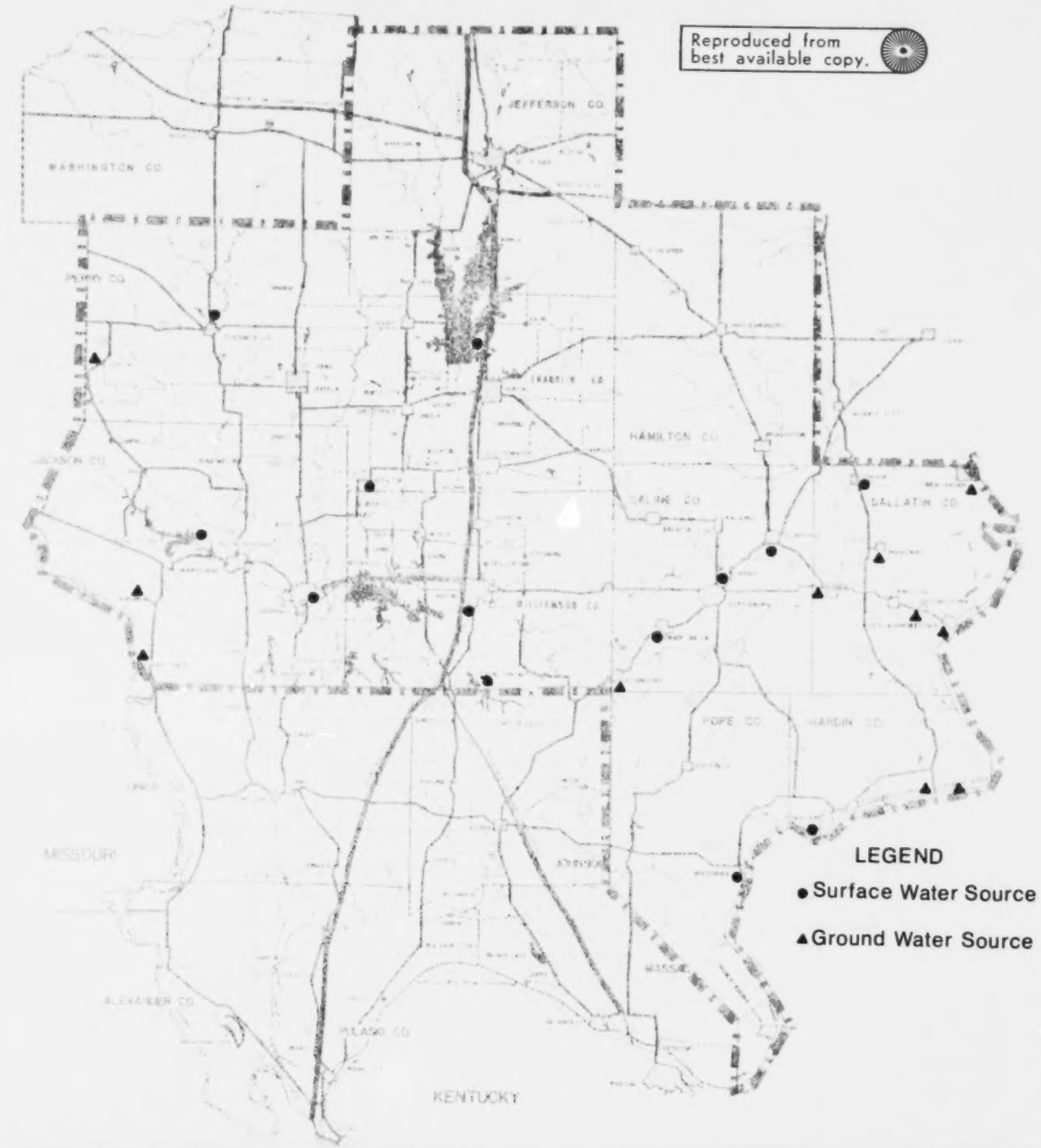
	Process Unit	Pollutants
Ground Water Treatment Plant	(a) Filter Backwash Water	Iron, Suspended Solids
	(b) Ion Exchanger Regeneration Waste	NaCl and Iron or Suspended solids, if there is no filter in unit prior to zeolite column
Surface Water Treatment Plant	(a) Clarifier or Sedimentation Tank Sludge	Highly concentrated suspended solids and added chemicals (lime & alum)
	(b) Filter Backwash Water	Low Concentrated suspended solids

A variety of operations may be employed in water treatment plants in different combinations depending on the quality of raw water and the quality desired in the finished water. The 208 area water treatment plants are divided into two groups, according to the source of raw water to be treated. A typical surface water treatment plant flow diagram is shown in Figure 9a, in which rapid mixing, flocculation, sedimentation, filtration, and chlorination units are employed in order to remove color, turbidity, tastes and odors, and bacteria from surface water supplies. The ground water treatment plants use one or several processes, as shown in flow diagram Figure 9b; the alternate arrangements are for disinfecting, iron removal, and waste softening process, depending upon the ground water quality.

The most common chemical used for water treatment processes is the 208 area are the following:

LOCATION OF WATER TREATMENT PLANTS

Reproduced from best available copy.



Map 3

NORTH

scale in miles

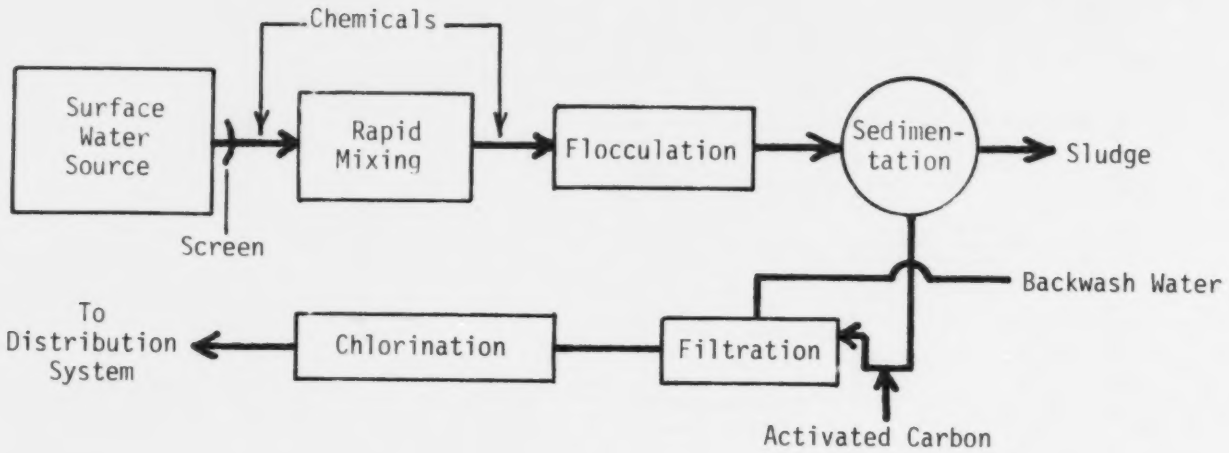
GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

The preparation of this map was financially aided through Federal Grant No. P005225-01 through the U.S. Environmental Protection Agency under the Water Pollution Control Act Amendments of 1972.

Figure 9

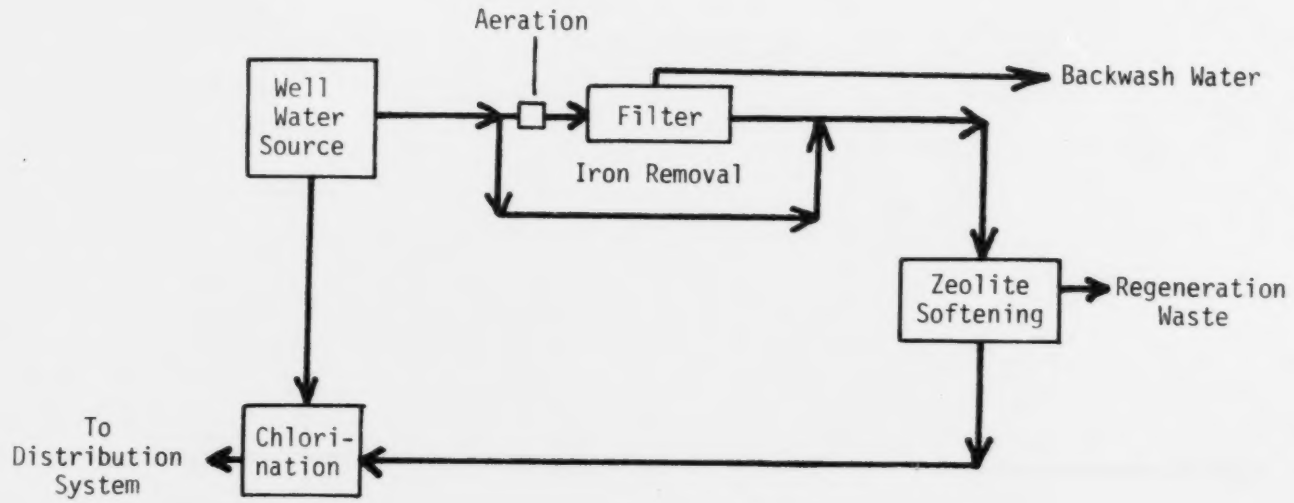
(a)

SURFACE WATER TREATMENT FLOW DIAGRAM



(b)

GROUNDWATER TREATMENT FLOW DIAGRAM



Source: GERP&DC Staff.

Chemical	Use
Alum (Al_2 (SO_4)$_3$ 14H_2O)	Coagulant
Lime $Ca(OH)_2$	Softening/Flocculation/Corrosion Control
Activated Carbon C	Taste and Odor Control
Zeolite Ion Exchanger (Na_2Z)	Water Softening
Brine (NaCl)	Ion Exchanger Regeneration
Chlorination	Disinfection

The quantity of lime/alum used for water treatment is listed in Table 15. The quantity used is basically dependent on raw water quality. Only a few treatment plants have an activated carbon facility. Zeolite ion exchangers are used to soften the ground water. Chlorination is the last treatment unit before the finished water leaves the plant, in almost all cases.

The Rend Lake water treatment plant has the only complete waste control system which includes retention tanks and a sludge drying bed. The Kinkaid Lake water plant has a closed-circuit system, from which the sludge is pumped out periodically. The Hardin County Water District plant has a holding lagoon for regenerative waste with an overflow arrangement. The Lake of Egypt Water plant has a holding tank and lagoon for filter backwash water and sludge storage, respectively. All the other treatment plants discharge their sludge, filter backwash water, or regenerative waste directly into the streams or ditches.

Impact on Regional Water Quality

The data related to water treatment plants is summarized in Table 16. It is evident from sludge and backwash water loading that the water treatment plants may be a significant point source of pollution. The backwash water from iron removal process and ion exchanger's regeneration waste discharges carries a high concentration of iron and chloride, respectively. High iron concentrations occur in groundwater sources in Southern Illinois; for example, Gorham's drift well raw water contains 27.8 mg/l iron, which is the highest concentration in the State. The discharges from such plants contain more than 1,000 mg/l iron concentration, and a red color is apparent in the discharge.

Table 15
RELATIONSHIP BETWEEN WATER TREATED AND
AMOUNT OF CHEMICAL USED IN THE 208 AREA

Water Treatment Facility	Water Treated* Gallons/Day	Chemical Used	
		Alum lbs./day	Lime lbs./day
Rend Lake	11,801,953	2,610	6,238
Carbondale	5,000,000	30,000	10,000
Kinkaid Lake	2,000,000	0	200
Marion	1,500,000	500	450
Harrisburg	1,150,740	301	250
Pinckneyville	760,000	180	430
Eldorado	505,067	100	100
Lake of Egypt	250,000	33	100
Royalton	250,000	125	125
Rosiclare	230,000	60	50
Carrier Mills	135,000	50	20
Golconda	80,000	-	-
Omaha	20,000	-	-

*1977 data collected by GERP&DC.

Table 16
WATER TREATMENT PLANTS

Facility	Source	Treatment Type	Flow MGD	Plant's Discharges Solid Lbs/Day Clarifier	Solid Lbs/Day Filter	Liquid Gal/Day Clarifier	Liquid Gal/Day Filter	Effluent Rec. Stream
Big Muddy River Basin								
Carbondale	Cedar Lake	Purification	3.4	4,272	260	102,000	170,000	Piles Fork
Cutler	Rock Wells	Disinfection	0.05	0	0	0	0	None
Gorham	Drift Well	Iron Removal	0.03	0	-	0	-	Ditch to Mississippi River
Grand Tower	Drift Well	None	0.07	0	0	0	0	None
Kinkaid Lake	Kinkaid Lake	Purification	2.0	-	-	-	-	Close Circuit System
Marion	I. Branch Crab Orchard Cr.	Purification	1.0	1,404	77	30,000	50,000	Tributary to Crab Orchard Creek
Pinckneyville	CI Beaucoup Cr.	Purification	0.3	702	38	15,000	25,000	Beaucoup Creek
Rend Lake	Rend Lake	Purification	10.4	14,597	796	-	-	Lagoons
Royalton	Big Muddy River	Purification	0.17	239	13	5,100	8,500	Big Muddy River
Saline-Ohio River Basin								
Carrier Mills	CI So. Fork Saline River	Purification	0.18	-	357	-	10,500	Ditch to S. Fork Saline River
Cave-In-Rock	Rock Wells	Chlorination	0.02	0	0	0	0	None
Eldorado	I. Wolf Creek	Purification	0.42	-	922	-	10,750	Ditch to Middle Fork Saline River
Equality	Rock Wells	Iron Removal	0.09	0	3.15	0	9,500	Cypress Ditch
Golconda	Ohio River	Purification	0.1	-	148	-	14,400	Ohio River
Hardin Co. Water Dist.	Drift Wells	Zeolite Soft.	0.03	0	1,050 (NaCl)(per regeneration)	0	3,853	Holding Pond with overflow to Ohio River
Harrisburg	I. Middle Fork Saline River	Purification	0.85	-	-	-	-	Middle Fork Saline River
Lake of Egypt Water Dist.	Lake of Egypt	Purification	0.25	-	-	137	430	Holding tank & Lagoon
Millstone Water Dist.	Rockwell	None		0	-	0	-	Plant is located outside 208 area

Table 16 (Cont'd)

Facility	Source	Treatment Type	Flow MGD	Plant's Discharges Solid Lbs/Day Clarifier	Solid Lbs/Day Filter	Liquid Gal/Day Clarifier	Liquid Gal/Day Filter	Effluent Rec. Stream
New Haven	Drift Well	Iron Removal Zeolite Soft.	0.04	0	-	0	-	Wabash River
Old Shawnee-town	Drift Wells	Iron Removal	0.01	0	0.06	0	3,000	Ohio River
Omaha	I. Trib. to Bear Creek	Purification	0.02	0	67	-	10,800	Bear Creek
Ridgway	Drift Wells	Iron Removal Zeolite Soft.	0.06	0	-	0	-	Tributary N. Fork Saline River
Rosiclare	Ohio River	Purification	0.14	-	328	-	18,900	Ohio River
Shawneetown	Drift Wells	Iron Removal	0.19	0	-	0	-	Ditch to Ohio River
Stonefort	Rock Wells	Chlorination	0.01	0	0	0	0	None

Source: Table developed by GERP&DC Staff based on Illinois Environmental Protection Agency 1975 Water Supply Data.

The exact impact on the area's water quality due to water treatment plant discharges is relatively unknown due to the lack of downstream data (near the outfalls). Pollutants, such as sulfate, iron, and suspended solids are also attributed to other sources of pollution, including mining and agriculture. Sufficient water quality data is not available in order to assess meaningfully the impact of water treatment plant discharges.

It is suspected that these discharges from water plants are degrading the water quality by inducing such pollutants in the streams as iron, dissolved solids, suspended solids, sulfate, chloride, etc. Most of the smaller discharges with low concentration of pollutants may not have significant impact on water quality, but large discharges such as that of Carbondale, have a definite impact on streams. The field observation of Piles Fork, which receives Carbondale's water plant discharge, confirms this assumption.

Overall, the future impact on regional water quality from water treatment plant wastewater is not anticipated to increase. It is possible that the existing waste load will decrease significantly if the larger plants add sludge control facilities. Furthermore, the region is not anticipating any new water treatment facilities in the near future.

Pollution Control Mechanisms

The technology to control the discharges from water plants is available. Since sludge characteristics vary from plant to plant and from process to process, the characteristics of the waste material should be determined before treatment, and disposal methods should be formulated for a given plant. Most water plant wastes are usually dewatered before ultimate disposal is undertaken. Dewatering techniques that could be used for sludge treatment include sand drying beds, lagoons, thickeners, centrifuges, vacuum filters, and pressure filters. The sludge may be discharged to the sanitary sewer and treated at the sewage treatment plant. The ultimate disposal of dewatered sludge is on land or in a sanitary land fill. Sludge is a nuisance and a pollutant in the stream, but it can be converted into a useful resource by chemical recovery; as a reclaiming agent for mined out acidic areas; or as a neutralizing agent for farm land.

An NPDES permit is required for discharging waste from water plants into streams. The I.E.P.A. requires that the operator should provide the

discharge data periodically. The Agency does not collect and analyze the sample, as in the case of other types of discharges.

The existing institutional arrangements between major water producers and the purchasing units of government offers the following benefits: optimization of the Regional resources; lower cost of finished water supply; 80% less discharges from water treatment plants into the streams; and cost-effective control of sludge from large treatment facilities.

Both the Rend Lake and Kinkaid Lake water treatment plants utilize acceptable waste control facilities. Larger communities such as Carbondale, Marion, and Harrisburg should speed up their efforts to control the discharges for water treatment plants. Sludge disposal techniques require further investigations.

Chapter 7

MINE DISCHARGES

Although mine drainage impacts are normally considered to be nonpoint source in origin, a number of circumstances exist in the course of active mining processes where point source discharges occur.

Definition

Mine-related point sources include the discharges from mechanical pumpage of open pit or underground mine water, pond overflow, spillway, drainage ditches, seepage from mine or mine refuse areas, sewage works outfall, and other effluent discharge pipes or sewers.

Existing Mine Point Sources of Pollution

Coal mining (surface and underground) and fluorspar mining are the two types of minerals mined within the 208 area. The location of active coal and fluorspar mines are shown on map 4. There are 146 mine-related permitted discharges in the 208 area. Of these, 132 are coal mining discharges and 14 are fluorspar mining discharges. The wastewater discharges from mining activities are classified as follows:

a. - Open pit or underground mine water pumpage;
b. - Overflow from coal preparation plants' slurry ponds, and fluorspar mills tailing ponds; and
c. - Sanitary wastewater.

According to river basins, these discharges are distributed as follows:

	Coal Mining	Fluorspar Mining
Big Muddy River Basin	75	0
Saline - Ohio River Basin	57	14

LOCATION OF COAL PREPARATION PLANTS AND FLUORSPAR MINES

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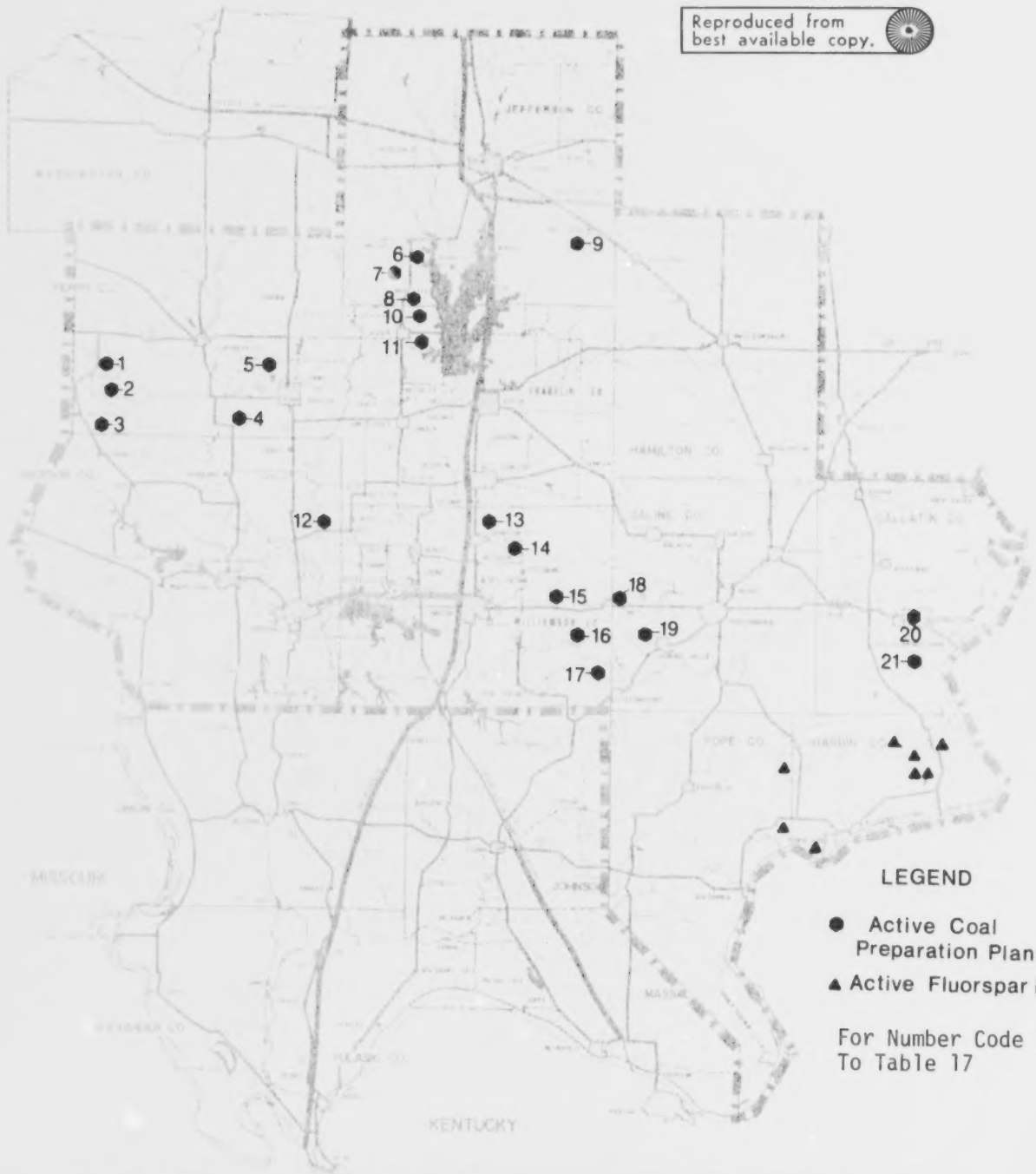


Map 4

NORTH

scale in miles

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

The preparation of this map was financially aided through Federal Grant No. P005225-01 through the U.S. Environmental Protection Agency under the Water Pollution Control Act Amendments of 1972

Mine operators are required to get a permit from the I.E.P.A. in order to open, reopen, or abandon any mine or mine refuse area. In case of discharges, the operators should comply with the mine effluent standards (Table 17) with respect to all natural or man-made discharges, including land runoff from said area. The discharges included all types of mine discharges. Dilution of the effluent from a treatment works source or discharge source is not acceptable as a method of treatment.

Some of the discharges from mining are of a domestic type. The discharges from surface/underground mines water pumping and coal preparation plants slurry ponds overflow are significant. Of course, some of the above-mentioned discharges may be intermittent; for example, slurry ponds may overflow during a heavy rainfall. But these cases are not very common. Poor practices, negligence, and economic factors lead the operator to discharge the mine wastewater which does not meet the effluent standard into the stream.

Coal preparation plant sites contain all kinds of coal wastes which are always a potential threat to the water quality unless they are disposed of permanently. A list of active coal preparation plants in the ten-county area is in Table 18. These 21 coal preparation plants are identified on Map 4. The NPDES permits issued to the coal preparation operators require that the effluent standards, as shown in Table 19, be met.

The quantity of coal mine pumped water is dependent on the weather and the hydrological and geological nature of the mine site. The area of the mine (surface or underground) is an important factor as well. The range of mine pumped water is from 1,000 gallons to 50,000 gallons per day; it varies from mine to mine. The effluent limitation for such discharge is shown in Table 19, which is required by NPDES permits to 208 area coal mine operators for both surface and underground operations.

The fluorspar is usually mixed with waste rock as it comes from mines. The fluorspar is separated at the milling plant by adding chemical reagents and employing various separation processes. The waste materials (the "tails") are usually carried as a slurry to a tailing pond, where they settle out. Overflow of such a tailing pond is considered a point source. Mine pumped water is the other type of discharge from fluorspar mining activity. Some of these underground fluorspar mines pump 60,000 to 70,000 gallons of water per day. Both types of discharges should meet the NPDES permit limits as shown in Tables 19 and 20.

Table 17
MINE EFFLUENT CRITERIA

Constituents	Concentration mg/l
Acid	(Total acid should not exceed total alkalinity)
Iron (total)	7.0
Lead (total)	1.0
Zinc (total)	5.0
Fluoride	8.0
Nitrogen (N)	5.0 (if operator is utilizing ammonia in wastewater treatment)
pH	5-10 (not subject to average)
Total Suspended Solids	50 (to be met only when a treatment facility exists), during a rainfall event 150 mg/l is applicable.
Total Dissolved Solids	No effluent standard, but the discharge should be limited to a level that will not cause the effluent receiving stream to exceed the water quality standard limit, which is 1,000 mg/l.

Source: State of Illinois, Pollution Control Board Regulations, Chapter 4, Mine Related Pollution, Springfield, Illinois, 1972.

Table 18
ACTIVE COAL PREPARATION PLANTS

1 - Consolidation Coal Company (Burning Star #4)

2 - Southwestern Illinois Coal Corporation (Captain)

3 - Amax Coal Company (Leahy)

4 - Freeman United Coal Mining Company (Fidelity)

5 - Consolidation Coal Company (Burning Star #2)

6 - Freeman United Coal Mining Corporation (Orient #6)

7 - Freeman United Coal Mining Corporation (Orient #3)

8 - Inland Steel Company (Inland #1)

9 - Eads, Robertson, and Associates, Inc.

10 - Old Ben Coal Corporation (#21)

11 - Old Ben Coal Corporation (#26)

12 - Consolidation Coal Company (Burning Star #5)

13 - Zeigler Coal Company (#4)

14 - Freeman United Coal Corporation (Orient #4)

15 - Harrisburg Coal Company

16 - Amax Coal Company (Delta #1)

17 - Peabody Coal Company (Will Scarlet)

18 - Amax Coal Company (Delta #2)

19 - Sahara Coal Company (#6, #21, #22) (Central)

20 - Peabody Coal Company (Eagle Strip)

21 - Peabody Coal Company (Eagle #2)

Source: GERP&DC Staff.

Table 19
NPDES PERMITTED EFFLUENT QUALITY FROM
SURFACE/UNDERGROUND COAL MINES

Parameter	Daily Ave. mg/l	Daily Max. mg/l
Total Suspended Solids	3.5	7.0
Iron (total)	3.5	7.0
Acidity	Alkalinity greater than acidity.	
pH	--	6-10 units
Total Dissolved Solids Sulfate	The effluent (TDS & Sulfate) concen. should be limited to a level that will not cause the receiving stream to exceed the water quality standard limits, which are: TDS--1,000 mg/l and sulfate--500 mg/l	

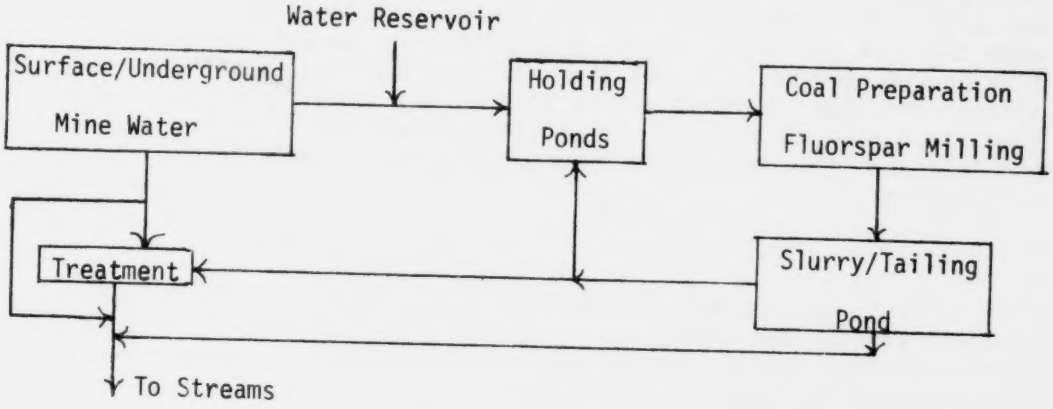
Source: National Pollutant Discharge Elimination System Permit Standards for Underground/Surface Coal Mines. Section 402, Federal Water Pollution Control Act.

Table 20
NPDES PERMITTED EFFLUENT QUALITY FROM COAL PREPARATION PLANTS

Parameter	Daily Ave. mg/l	Daily Max. mg/l
Total Suspended Solids	--	15
Iron (total)	--	2
Acidity	Alkalinity greater than acidity.	
Oil & Grease	10	15
pH	--	6-10 units
Total Dissolved Solids Sulfate	The effluent (TDS & Sulfate) concen. should be limited to a level that will not cause the receiving stream to exceed the water quality standard limits, which are: TDS--1,000 mg/l and sulfate--500 mg/l	

Source: National Pollutant Discharge Elimination System Permit Standards for Coal Preparation Plants. Section 402 Federal Water Pollution Control Act.

Most of the mines in the region have complex closed circuit type systems in which water circulates in the system, unless a heavy rainfall forces the operators to pump/discharge into the stream or an overflow occurs at the slurry/tailing pond. A typical arrangement can be as follows:



Some of the facilities treat their effluent before discharging it into the stream. The most common treatment method is a neutralization process, using lime or limestone. Peabody's Will Scarlet treatment facility uses lime/limestone for acid mine drainage treatment.

A number of mines, especially small operations or those mines which do not have a coal preparation plant or fluorspar milling plant close to the pumpage site, directly discharge their mine water into a pit or settling ponds which eventually discharges into the stream.

Impact on Water Quality

The coal mine-related water pollution is so complicated in the area that it cannot be addressed entirely in this section. There are so many point sources from coal mining areas that it difficult to assess the problem. The problem is not point sources only; it is aggregated with non-point mining and abandoned coal mining areas. The impact from coal preparation plants due to slurry or holding pond overflow is not determined, since sufficient data is not available. The discharges from active surface mining areas are definitely degrading the water quality. These discharges may be the surface runoff or mine pumped water from active mining operations. Data from three of the 208 water quality monitoring stations show the degraded water quality in these streams. The watershed above the monitoring stations contains active coal surface

mining. The collected water quality analysis data are presented in Table 21. The samples were collected before and after a significant rainfall (minimum 0.2 inch). The record shows that most of the times during low flow, the concentration of sulfate and total dissolved solids was high, and concentration of iron and suspended solids was low. But when the flow increased, due to precipitation, the pollutant concentration was reversed: it was then low in sulfate and total dissolved solids, and high in iron and suspended solids. The conclusion: high flow after rainfall diluted the emitted sulfate and dissolved solids, but increased the iron and suspended solids due to erosion of the disturbed area.

Five Illinois Environmental Protection Agency Water Quality monitoring stations are located within the fluorspar district. These stations are downstream from both active and abandoned mine and mill sites. Analysis were examined for fluoride, zinc, lead, and total dissolved solids. IEPA monitoring data is summarized in Table 22. The data presented in the Table suggests that the greatest impact on water quality appears to be due to lead. Because four of six violations occurred during a short period of time (March - May, 1974), other factors besides fluorspar mines might have caused the violation. It does not appear that major water quality problems exist in the Southern Illinois 208 area as a result of either active or abandoned fluorspar mines.

Many miles of the region's waterways are degraded by coal mine originated pollution. Some of the streams carry only acid mine drainage. Dead trees and orange colored stream beds are the typical environment of the stream. The water quality reflects low pH, high dissolved solids, high sulfates, and heavy metals, and these streams do not support any fish or higher biological life. The current status (active or abandoned) of a mine is the most important factor in water pollution control. The vast majority of polluting mines are abandoned. Active mines contribute only a fraction of the mine waste loading on regional waters. Even if all the state discharge requirements are fully implemented, it appears that the polluted streams will not improve significantly. A regional reclamation program for abandoned mine areas is essential to improve the water quality. To control further pollution from the mining industry, all the discharges should be monitored to assure the water quality of those streams which are not yet polluted.

Pollution Control Mechanisms

There are two primary types of pollution control: (a) control at source abatement (prevention of formation of pollutants) and (b) treat-

Table 21
ACTIVE SURFACE COAL MINE
IMPACT ON WATER QUALITY

Station #B-16 (Saline Basin)
No. of Samples Collected-10 Sampling Period: Jan, 1977 to May, 1977

	pH	Iron mg/l	Sulfate mg/l	TDS mg/l	TSS mg/l	Net Alkalinity mg/l
Minimum	5.6	0.05	92	270	5	-10
Maximum	8.0	19.20	2,300	4,400	1,100	+330
Mean	---	5.13	811	1,490	373	One time acidity exceeded

Station #B-17 (Saline Basin)
No. of Samples Collected-10

Minimum	4.8	0.30	50	165	6	-100
Maximum	7.6	80.00	1,600	2,600	800	+140
Mean	---	14.20	682	1,195	262	Two times acidity exceeded

Station #P-2 (Big Muddy Basin)
No. of Sampled Collected-6

Minimum	6.6	0.30	275	540	15	+50
Maximum	7.9	19.00	1,400	2,460	660	+190
Mean	---	4.80	924	1,665	234	+143

Source: 208 Micro-shed monitoring data

Table 22
IEPA WATER QUALITY DATA IN FLUORSPAR MINE AREA

I.E.P.A. Stations	Fluoride mg/l	Zinc mg/l	Lead mg/l	TDS mg/l
Stream Standard	1.4	1.0	0.1	1,000
AK-01	--(19)*	--(17)	0.12 (18) 12/6/73 0.33 3/27/74	--(77)
AK-02	--(11)	--(10)	0.18 (11) 3/28/74	--(66)
AL-01	--(15)	--(14)	1.0 (15) 5/22/74	1,200(77) 9/17/74
AO-01	--(14)	--(14)	1.16 (14) 3/28/74	--(65)
AT-02	--(25)	--(24)	0.15 (26) 4/18/72	--(46)

*Number of samples collected between 1972 and 1976 are shown in parentheses.
--Indicate no violation of general stream standard. If violation occurred, the date and value reported is given.

ment of the mine drainage. Mine water pollution control is a relatively new field. Many new techniques have been demonstrated with varying degrees of success. The following processes have been used successfully with an acceptable effluent quality resulting:

- Neutralization with limestone;
- Neutralization with lime;
- Evaporation;
- Reverse Osmosis;
- Electrodialysis;
- Ion Exchange;
- Freezing;
- Iron oxidation.

Some of the technology is still crude and not available for large clean-up operations. Cost is an important factor in selecting a treatment process for mine drainage. Limestone can be used effectively to treat mine drainage that contains mostly ferric iron. One problem is that limestone will coat with a film of calcium and iron sulfate which will slow, and eventually stop, the reaction. For acid drainages which contain significant amounts of iron, a means to keep the limestone free of this coating is necessary. The possibility of utilizing other systems in the 208 area should be explored with the possibility of granting variances from the effluent standard to the operators for experimenting with new technology.

The IEPA has broad powers in the area of water pollution control with respect to active mines. Point sources of pollution are regulated through NPDES permits, in which effluent standards are set and a time-table for meeting the standard is imposed. Current legislative controls and guidelines help minimize operational and post-operational effects from mining; however, this has not always been the case. A number of discharges do not meet the effluent requirement; the reasons might be one of the following:

(a) The IEPA does not monitor the effluent quality, so identification of the pollutor and implementation of the regulation cannot be achieved;

(b) The cost of treating the mine wastewater may be so high that the operator cannot afford it;

(c) The technology is not available to control all the required water quality parameters.

One of the basic demands is the adjustment of the water quality mine discharge standard so that it can realistically be achieved in the 208 area. The regional planning commissions may be of assistance to the regulatory agencies and coal operators in establishing water quality

goals for the region based on economics, technical feasibility, public needs, and future growth. The need for such a management structure is essential.

Chapter 8

SUMMARY AND CONCLUSION

Previous chapters have identified and evaluated the various point sources of pollution which impact areawide water quality. Basic wastewater characteristics of point source discharges and descriptions of available technology to control these discharges were included in the assessment.

Ranking of Point Sources of Pollution

A general ranking of the six types of point source discharges was conducted in order to assess the relative problems created within the area.

Eleven "quality functions" were selected to determine and rank the water pollution problems due to various point source discharges:

Point Source Effluent

(1) Discharge from source (gallons/day) "quantity"
(2) Quality violation (number of parameters violated)
(3) Quality violation (% of effluent criteria violated during dry weather)
(4) Quality violation (% of effluent criteria violated during wet weather)

Impact on Regional Water Quality

(5) Impact on stream quality (during high flow period)
(6) Impact on stream quality (during low flow period)
(7) Impact on lake quality
(8) Impact on fishing and swimming
(9) Health issues
(10) Public concern
(11) Future problems without point source plan (need)

Each of the quality functions were assigned weights ranging from one (good) to four (poor) in order to indicate the severity of the discharge as well as to determine or measure the relationship between given point sources and the quality function.

The weight factors of each quality function is summed to obtain a total weight for the six types of point source discharges (Table 23). Priority ranking is based on the total (and highest) weight factors. This process identifies the most significant problem point source discharges in rank order:

Priority A: Municipal (35), and Mine discharges (35);

Priority B: Private (25), Industrial (24), and Water Treatment plant (23) discharges; and

Priority C: Feedlot (12) discharges.

A further output of Table 23 is the relative ranking of each quality function based upon the total weights assigned under the six types of point source discharges (right hand column). A review of these rankings indicates the quality functions which overall are most sensitive to the point source discharges. For example, point source effluents during wet weather constitute more severe water quality violations from all point source discharges. Conversely, the least point source problem is caused by the quantity of point source discharges.

It should be noted that these rankings reflect the relative significance of point source discharges only, and do not include nonpoint sources. However, the rankings do furnish a perspective on which point sources should be addressed in developing control mechanisms.

Impact on Water Quality

The violation of state standards depend on the characteristics and distribution of the point source discharges within any single watershed as well as the size and background ambient water quality of the receiving stream. A number of point source discharges, as well as nonpoint sources, exert similar effects on the receiving stream.

Table 23
POINT SOURCES OF POLLUTION RANKING

Quality Functions	Ranking Index						Function Priority	Ranking
	Municipal	Industrial	Private	Feedlot	Water Plant	Mine		
Point Source Effluent								
Quantity Discharged (Gallon per Day)	3	1	1	0	2	3	10	7
Quality Violation (# of parameters)	3	2	3	1	3	4	16	2
Quality Violation (dry weather)	3	3	2	1	3	3	15	3
Quality Violation (wet weather)	4	2	3	2	1	5	17	1
Impact on Water Quality								
On Streams (high flow)	2	2	2	1	2	3	12	6
On Streams (low flow)	4	2	2	1	3	4	16	2
On Lakes	4	2	3	1	2	2	14	4
On Fishing/Swimming	3	2	2	1	2	3	13	
Health Issues	4	2	3	1	2	2	14	4
Public Concern	4	3	2	1	2	2	14	4
Needs of Point Source Plan	1	3	2	2	1	4	13	5
Ranking Priority	35 A	24 B	25 B	12 C	23 B	35 A		

The parameters whose standards are most frequently violated by point source discharges are: dissolved oxygen; fecal coli; ammonia-N; and phosphorus. These same water quality standards may be violated by nonpoint sources as well; however, sufficient data to develop impact allocations to both source types is unavailable.

In the final analysis, point source impacts are measurable and it is recognized that uncontrolled point source discharges degrade water quality. Municipal discharges constitute the principal point source impact on water quality. Private point source discharges constitute the most localized, but often severe, water quality problem especially from those serving residential areas. Industrial point source discharges as a general rule have not constituted a water quality problem except where an operational failure may occur. Discharges from water treatment plants appear to have not been previously considered as a serious issue, however, it possesses the potential to adversely affect water quality. Point source discharges attributed to mine operations, if uncontrolled, may equal or exceed municipal discharge impact.

State and federal agencies that regulate stream pollution have based their stream water quality standards on a flow condition in a stream. The 7-day, 10-year zero flow is defined as the lowest average flow (dry stream) that occurs for a consecutive 7-day period at a recurrence interval of 10 years. That is, over a long period of years, the average time interval between 7-day zero flow of this severity will be 10 years. The point source impact on water quality varies from stream to stream. The impact on lakes and 7-day, 10-year zero flow streams is significant.

General Control Mechanisms

The technology to control point source discharges is available to meet the 1983 water quality goals. The most cost-effective system is dependent upon a combination of structural and nonstructural controls. This approach is especially effective in addressing municipal, industrial, and private point source discharges. Feedlot and mine point source discharges will in most, if not all instances, require structural solutions.

Regulatory programs, especially with respect to effluent standards, will continue to be necessary in order to ensure that discharges remain within acceptable pollutant levels.

Conclusions

Municipal point source discharges constitute the most critical problem requiring control mechanisms. However, the large capital investment associated with structural controls may preclude timely resolution of these issues before 1983. The institution of sewer bans by the regulatory agency, ostensibly to prevent continued overloading of the existing systems, results in an increasing number of private point source discharges in the periphery of the municipality. The community, not wishing to impede overall growth patterns, normally requires the new developments to meet existing private discharge standards rather than instituting strict land use controls.

Nonstructural controls in the area are underutilized, and those currently in use are administered by only a few municipalities. The presence of a large number of private point source discharges indicates the overall lack of nonstructural controls such as zoning or subdivision regulations. The only significant control is the regulatory and permitting authority of the State of Illinois which lessens the magnitude of private point source impact on water quality.

Pretreatment of effluent by industries located within a municipal system is practiced sporadically. There is a growing awareness by municipalities of industrial loading problems. Other point source discharges appear to be controlled through the NPDES permit system administered by the state.

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